PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* N.75180A JGL

Box No. I TITLE OF INVENTION

DATA COMMUNICATION SYSTEM

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

FORMULA ONE ADMINISTRATION LIMITED
14/16 Great Portland Street
London
W1N 6BL

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State *(that is, country)* of nationality: GB

State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

BAKER, Edward Hendry
1 The Grange
Outwood Lane
Bletchingley
SURREY RH1 4LR

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is,country)* of nationality: GB

State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

LEEMING, John Gerard
J.A. KEMP & CO.,
14 South Square,
Gray's Inn,
London, WC1R 5LX,
United Kingdom.

Telephone No.
+44 171 405 3292

Facsimile No.
+44 171 242 8932

Teleprinter No.
23676

☐ **Adress for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

BALCOMBE, Bryn James
5 Victoria Gardens
Biggin Hill
KENT TN16 3DH

This person is:
- ☐ applicant only
- ☒ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: GB

State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

BARCZYNSKI, Henry
37a Stoneham Street
Coggeshall
ESSEX
C06 1UH

This person is:
- ☐ applicant only
- ☒ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: GB

State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:
- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:
- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a)*(mark the applicable check-boxes; at least one must be marked)*:

Regional Patent

- ☒ AP **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT*(if other kind of protection or treatment desired, specify on dotted line)* .....

National Patent *(if other kind of protection or treatment desired, specify on dotted line)*:

- ☒ AL Albania .....
- ☒ AM Armenia .....
- ☒ AT Austria .....
- ☒ AU Australia .....
- ☒ AZ Azerbaijan
- ☒ BA Bosnia and Herzegovina .....
- ☒ BB Barbados
- ☒ BG Bulgaria .....
- ☒ BR Brazil .....
- ☒ BY Belarus .....
- ☒ CA Canada
- ☒ CH and LI Switzerland and Liechtenstein
- ☒ CN China .....
- ☒ CU Cuba .....
- ☒ CZ Czech Republic .....
- ☒ DE Germany .....
- ☒ DK Denmark .....
- ☒ EE Estonia .....
- ☒ ES Spain .....
- ☒ FI Finland .....
- ☒ GB United Kingdom
- ☒ GD Grenada
- ☒ GE Georgia .....
- ☒ GH Ghana .....
- ☒ GM Gambia
- ☒ HR Croatia .....
- ☒ HU Hungary .....
- ☒ ID Indonesia
- ☒ IL Israel .....
- ☒ IN India .....
- ☒ IS Iceland
- ☒ JP Japan .....
- ☒ KE Kenya .....
- ☒ KG Kyrgyzstan .....
- ☒ KP Democratic People's Republic of Korea .....
- ☒ KR Republic of Korea .....
- ☒ KZ Kazakhstan .....
- ☒ LC Saint Lucia
- ☒ LK Sri Lanka
- ☒ LR Liberia
- ☒ LS Lesotho .....
- ☒ LT Lithuania
- ☒ LU Luxembourg
- ☒ LV Latvia
- ☒ MD Republic of Moldova .....
- ☒ MG Madagascar .....
- ☒ MK The former Yugoslav Republic of Macedonia .....
- ☒ MN Mongolia
- ☒ MW Malawi .....
- ☒ MX Mexico .....
- ☒ NO Norway
- ☒ NZ New Zealand .....
- ☒ PL Poland .....
- ☒ PT Portugal .....
- ☒ RO Romania
- ☒ RU Russian Federation .....
- ☒ SD Sudan
- ☒ SE Sweden
- ☒ SG Singapore
- ☒ SI Slovenia .....
- ☒ SK Slovakia .....
- ☒ SL Sierra Leone
- ☒ TJ Tajikistan .....
- ☒ TM Turkmenistan .....
- ☒ TR Turkey .....
- ☒ TT Trinidad and Tobago .....
- ☒ UA Ukraine .....
- ☒ UG Uganda .....
- ☒ US United States of America .....
- ☒ UZ Uzbekistan .....
- ☒ VN Viet Nam .....
- ☒ YU Yugoslavia .....
- ☒ ZW Zimbabwe .....

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☐ .....
- ☐ .....
- ☐ .....

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)*

Supplemental Box *If the Supplemental Box is not used, this sheet should not be included in the request.*

*1. If, in any of the Boxes, **the space is insufficient** to furnish all the information: in such case, write "Continuation of Box No. ..." [indicate the number of the Box] and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:*

*(i) **if more than two persons are involved as applicants and/or inventors** and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;*

*(ii) if, in Box No. II or in any of the sub-boxes of Box No. III, the indication **"the States indicated in the Supplemental Box"** is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;*

*(iii) if, in Box No. II or in any of the sub-boxes of Box No. III, **the inventor** or **the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America**: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;*

*(iv) if, in addition to the agent(s) indicated in Box No. IV, there are **further agents**: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;*

*(v) if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication **"patent of addition"** or **"certificate of addition"** or if, in Box No. V, the name of the United States of America is accompanied by an indication **"continuation"** or **"continuation-in-part"**: in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;*

*(vi) if, in Box No. VI, there are **more than three earlier applications whose priority is claimed**: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI;*

*(vii) if, in Box No. VI, **the earlier application is an ARIPO application** in such case, write "Continuation of Box No. VI", specify the number of the item corresponding to that earlier application and indicate at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed.*

*2. If, with regard to the **precautionary designation statement** contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.*

*3. If the applicant claims, in respect of any designated Office, the benefits of provisions of the national law concerning **non-prejudicial disclosures or exceptions to lack of novelty**: in such case, write "Statement concerning non-prejudicial disclosures or exceptions to lack of novelty" and furnish that statement below.*

GOLDIN, Douglas Michael; ELLIS-JONES, Patrick George Armine; BARLOW, Roy James; SENIOR, Alan Murray; BENTHAM, Stephen; AYERS, Martyn Lewis Stanley; WOODS, Geoffrey Corlett; CRESSWELL, Thomas Anthony; SEXTON, Jane Helen; NICHOLLS, Michael John; MARSHALL Monica Anne; WEBB, Andrew John; KEEN, Celia Mary; PRICE, Nigel John King; IRVINE, Jonquil Claire; LEEMING, John Gerard; DUCKWORTH, Timothy John; MCCLUSKIE, Gail Wilson; WRIGHT, Simon Mark; CURWEN, Julian Charles Barton; CLEEVE, James Harold Findlay; SMITH, Samuel Leonard; BENSON, John Everett, CAMPBELL Patrick John; MERRYWEATHER, Colin Henry; DUCKETT, Anthony Joseph; MIDGLEY, Jonathan Lee; BENTHAM, Andrew; and ROQUES, Sarah Elizabeth; SRINIVASAN, Ravi Chandran; FAULKNER, Charlotte Waveney and TYSON, Robin Edward of: J.A. KEMP & CO., 14 South Square, Gray's Inn, London, WC1R 5LX, United Kingdom.

Box No. VI PRIORITY CLAIM ☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: national application: country	regional application:* regional Office	international application: receiving Office
item (1) (05/03/1998)	9804730.1	GB		
item (2) (07/08/1998)	9817297.6	GB		
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office)* identified above as item(s) (1) and (2)

* *Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.*

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):*

ISA / EP

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority):*

Date *(day/month/year)* Number Country *(or regional Office)*

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following **number of sheets**:

request	: 5
description (excluding sequence listing part)	: 23
claims	: 4
abstract	: 1
drawings	: 10
sequence listing part of description	: 0
Total number of sheets	: 43

This international application is **accompanied by** the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological materia
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other *(specify)*:

Figure of the drawings which should accompany the abstract: 2

Language of filing of the international application: ENGLISH

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

LEEMING, John Gerard
AUTHORISED REPRESENTATIVE

For receiving Office use only

1. Date of actual receipt of the purported international application:	2. Drawings: ☐ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority (if two or more are competent): ISA /	6. ☐ Transmittal of search copy delayed until search fee is paid.

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

This sheet is not part of and does not count as a sheet of the international application.

PCT

FEE CALCULATION SHEET

Annex to the Request

For receiving Office use only

International application No.

Date stamp of the receiving Office

Applicant's or agent's file reference N.75180A JGL

Applicant
FORMULA ONE ADMINISTRATION LIMITED ET AL

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE . . . . . £ 55 T

2. SEARCH FEE . . . . . £ 812 S

International search to be carried out by _____
(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

The international application contains _____ sheets.

first 30 sheets . . . . . £ 285 b1

13 remaining sheets x £6 additional amount = £ 78 b2

Add amounts entered at b1 and b2and enter total at B . . . . £ 363 B

Designation Fees

The international application contains 77 designations.

10 number of designation fees payable *(maximum 10)* x £65 amount of designation fee = £ 650 D

Add amounts entered at B and Dand enter total at I . . . . . £ 1013 I

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT *(if applicable)* . . . . . £ 22 P

5. TOTAL FEES PAYABLE . . . . . £ 1902
Add amounts entered at T, S, I and P,and enter total in the TOTAL box — TOTAL

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

☐ authorization to charge deposit account (see below)	☐ bank draft	☐ coupons
☒ cheque	☐ cash	☐ other *(specify):*
☐ postal money order	☐ revenue stamps	

DEPOSIT ACCOUNT AUTHORIZATION *(this mode of payment may not be available at all receiving Offices)*

The RO/ _____ ☐ is hereby authorized to charge the total fees indicated above to my deposit account.

☐ *(this check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit)* is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

☐ is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

Deposit Account No. | Date *(day/month/year)* | Signature

See Notes to the fee calculation sheet

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ EP

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA	Date of receipt of DEMAND

Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION

Applicant's or agent's file reference:

International application No.	International filing date *(day/month/year)*	(Earliest) Priority date *(day/month/year)*
PCT/GB99/00590	26 February 1999	5 March 1998

Title of invention:
DATA COMMUNICATION SYSTEM

Box No. II APPLICANT(S)

Name and address: *(Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)*

FORMULA ONE ADMINISTRATION LIMITED
14/16 Great Portland Street
London W1N 6BL
UNITED KINGDOM

Telephone No.:

Facsimile No.:

Teleprinter No.:

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
GB	GB

Name and address: *(Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)*

BAKER, Edward, Hendry
1 The Grange
Outwood Lane
Bletchingley
Surrey RH1 4LR
UNITED KINGDOM

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
GB	GB

Name and address: *(Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)*

BALCOMBE, Bryn, James
5 Victoria Gardens
Biggin Hill
Kent
TN16 3DH
UNITED KINGDOM

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
GB	GB

[X] Further applicants are indicated on a continuation sheet.

See Notes to the demand form

Sheet No. 2..

International application No.
PCT/GB99/00590

Continuation of Box No. II APPLICANT(S)

If none of the following sub-boxes is used, this sheet should not be included in the demand.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

BARCZYNSKI, Henry
37a Stoneham Street
Coggeshall
Essex
CO6 1UH
UNITED KINGDOM

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
GB	GB

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

☐ Further applicants are indicated on another continuation sheet.

International application No.
PCT/GB99/00590

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is [X] agent [ ] common representative

and [X] has been appointed earlier and represents the applicant(s) also for international preliminary examination.

[ ] is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.

[ ] is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

J G LEEMING
J.A. KEMP & CO.,
14 South Square,
Gray's Inn,
London, WC1R 5LX,
United Kingdom.

Telephone No.: +44 171 405 3292

Facsimile No.: +44 171 242 8932

Teleprinter No.: 23676

[ ] Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments:*

1. The applicant wishes the international preliminary examination **to start on the basis of:**

[X] the international application as originally filed

the description [ ] as originally filed
[ ] as amended under Article 34

the claims [ ] as originally filed
[ ] as amended under Article 19 (together with any accompanying statement)
[ ] as amended under Article 34

the drawings [ ] as originally filed
[ ] as amended under Article 34

2. [ ] The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. [ ] The applicant wishes the start of the international preliminary examination **to be postponed** until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English

[X] which is the language in which the international application was filed.

[ ] which is the language of a translation furnished for the purposes of international search.

[ ] which is the language of publication of the international application.

[ ] which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby **elects all eligible States** *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes **not to elect:**

Sheet No. 4

International application No.
PCT/GB99/00590

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:			For International Preliminary Examining Authority use only: received	not received
1. translation of international application	:	sheets	☐	☐
2. amendments under Article 34	:	sheets	☐	☐
3. copy (or, where required, translation) of amendments under Article 19	:	sheets	☐	☐
4. copy (or, where required, translation) of statement under Article 19	:	sheets	☐	☐
5. letter	: 1	sheets	☐	☐
6. other *(specify)*	:	sheets	☐	☐

The demand is also accompanied by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ nucleotide and or amino acid sequence listing in computer readable form
6. ☐ other *(specify)*:

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

LEEMING, JOHN GERARD

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. ☐ The applicant has been informed accordingly.
4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

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Demand received from IPEA on:

CHAPTER II

PCT

FEE CALCULATION SHEET

Annex to the Demand for international preliminary examination

International application No.	PCT/GB99/00590
Applicant's or agent's file reference	N.75180A JGL

For International Preliminary Examining Authority use only

Date stamp of the IPEA

Applicant FORMULA ONE ADMINISTRATION LIMITED

Calculation of prescribed fees

1. Preliminary examination fee ..... EUR 1533 P

2. Handling fee *(Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.)* ..... EUR 148 H

3. Total of prescribed fees
Add the amounts entered at P and H and enter total in the TOTAL box ..... EUR 1681
TOTAL

Mode of Payment

- ☐ authorization to charge deposit account with the IPEA (see below)
- ☐ cheque
- ☐ postal money order
- ☐ bank draft
- ☐ cash
- ☐ revenue stamps
- ☐ coupons
- ☐ other *(specify)*:

Deposit Account Authorization *(this mode of payment may not be available at all IPEAs)*

The IPEA/ EP ☒ is hereby authorized to charge the total fees indicated above to my deposit account.

☒ *(this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit)* is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

2805.0038	30 September 1999	LEEMING, John Gerard
Deposit Account Number	Date *(day/month/year)*	Signature

M.H (not translated but page by page)

17

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
./.		
International application No.	International filing date (day/month/year)	Priority date (day/month/year)
PCT/GB 99/00590	26/02/1999	05/03/1998
International Patent Classification (IPC) or national classification and IPC		
H04N7/18		
Applicant		
FORMULA ONE ADMINISTRATION LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This **REPORT** consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by **ANNEXES**, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consists of a total of 15 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
04/10/1999	23.03.00
Name and mailing address of the IPEA/	Authorized officer
European Patent Office D-80298 Munich Tel. (+49-89) 2399-0, Tx: 523656 epmu d Fax: (+49-89) 2399-4465	B. Stannartz

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/00590

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1,2,5,7-23	as originally filed			
3,4,6	as received on	21/02/2000	with letter of	18/02/2000

Claims, No.:

1-12	as originally filed			
13-15	as received on	21/02/2000	with letter of	18/02/2000

Drawings, sheets:

1/10-10/10	as received on	19/05/1999	with letter of	10/05/1999

2. The amendments have resulted in the cancellation of:

☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-15
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-15
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-15
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

V Reasoned statement under Article 35(2)

All three of independent claims 1, 12 and 13 relate to transmitting a video signal from a moving object to stationary receivers, and all three include determining the position of the moving object using indications other than parameters of the received signal. Both prior art documents cited in the Search Report relate to a system for transmitting a signal from a moving object to stationary receivers but neither document discloses or suggests determining the position of the moving object using indications other than the parameters of the received signal. The claimed subject matter can thus be considered to be new and to have inventive step.

The claimed subject matter has industrial applicability in the field of transmitting video signals from moving objects to stationary receivers.

VII Certain defects in the international application

1 The independent claims are not drafted in two-part form with respect to the disclosure of GB-A-2 307 375 {Rule 6.3(b)} - it is considered appropriate that they be so drafted.

2 The description does not cite a document reflecting the background art {Rule 5.1(a)(ii)} - it would be appropriate to cite GB-A-2 307 375.

VIII Certain observations on the international application

Independent claim 12 should be amended to state that the step of selecting the signal received by one of the first and second receivers is performed in dependence on the location of the moving object as determined in the "determining the location" step - this should be done to ensure consistency between claim 12 and independent claims 1 and 13 as to what the invention is, and to ensure that claim 12 is supported by the description {Article 6}.

overlapping detection areas and being located at spaced apart locations;

a position detector for generating a position signal indicative of the position of said mobile object using indications other than parameters of the received video signal and carrier;

a controller responsive to said position signal for selecting one of the video signals received by said first and second receivers and outputting said selected signal, said controller being located other than in said mobile object.

According to the present invention there is also provided a method of communicating a video signal between a mobile object and a stationary location comprising:

transmitting the video signal on a first carrier frequency from a transmitter on the mobile object;

providing at least first and second receivers at spaced apart locations for receiving the signal from the transmitter on said first carrier frequency; and

determining the location of said mobile object using indications other than signal parameters of the received signal or its carrier;

selecting the signal received by one of said first and second receivers for output at said stationary location.

The present invention still further provides a method of establishing a communication system for communicating a video signal between a mobile object provided with a transmitter for transmitting the video signal on a first carrier frequency and a stationary location comprising a plurality of receivers each having a detection area within which the receiver is able to receive the signal from the transmitter on said first carrier frequency when the transmitter is in the detection area, the method comprising the steps of:

placing a first receiver at a first location;

calculating a distance from said first location at which reflection by a reflecting surface of a signal transmitted from said mobile object will cause the received power level at said first receiver to drop below a predetermined level to define a first

determining a position for each subsequent receiver by calculating a distance at which reflection from a reflecting surface will cause the received power to drop below said predetermined level to determine a detection area and positioning said subsequent receiver at a distance from the previous receiver such that the detection area of the subsequent receiver overlaps with the detection area of the previous receiver to form a continuous strip within which the signal from the transmitter is receivable by at least one of the receivers;

providing means whereby the signal received by said at least one receiver can be provided to said stationary location; and

providing means to determine the position of said mobile object using indications other than parameters of the received signal and carrier and to control switching between receivers on the basis of the determined position.

The present invention is arranged so that switching between receivers is carried out on the basis of the position of the mobile object. The receivers are preferably arranged so that the area in which they can receive signals at an acceptable level overlaps with the receiver in the corresponding adjacent area.

The transmitters on the mobile object may be arranged to be able to transmit on a number of different frequencies. Similarly, the receivers may also be adapted to receive on a number of different frequencies. The operating frequencies of the transmitters and the receivers are preferably controlled by data messages sent from a central location to the moving objects and receiver stations. Each frequency may be received by a dedicated antenna (i.e. each receiver having its own antenna) or a single antenna and an RF splitter may be used with a proportion of the RF signal being directed to each receiver. The receiver selects the wanted frequency in the RF signal.

The video signal is preferably transmitted from the mobile object to the receivers using a microwave carrier. This is preferably at 2.5 GHz. Other data and

racetrack;

Figure 2 shows a representative arrangement of receiver stations relative to each other and the respective switching positions for switching from the receiver in one station to the next;

Figure 3 shows a schematic layout of the arrangement of one of the receiver stations according to the present invention;

Figure 4 shows a schematic layout of the signal relay system of an embodiment of the present invention;

Figure 5 shows a schematic example of a node used in the signal relay system;

Figures 6A and B show an example of the detection range of an antenna; and

Figure 7.1 to 7.4 are diagrams referred to in explaining how the Communication system according to the invention is set up.

Figure 1 shows an example of a section of racetrack 1 and a suitable arrangement of receiver stations 2 (referred to herein as stations) around such a section of track to provide continuous reception of a video signal from an on-board camera in a racing car. The embodiment of the present invention described herein relates to a system for providing communication of a video signal from a moving racing car to a fixed location such as an outside broadcast unit. Each station includes at least one antenna and one receiver. This is preferably a directional antenna (e.g. helix antenna) but may be an omnidirectional antenna. The dashed lines in Figure 1 provide an indication of the detection angle of the antenna on each station 2.

13. A method of establishing a communication system for communicating a video signal between a mobile object provided with a transmitter for transmitting the video signal on a first carrier frequency and a stationary location comprising a plurality of receivers each having a detection area within which the receiver is able to receive the signal from the transmitter on said first carrier frequency when the transmitter is in the detection area, the method comprising the steps of:

placing a first receiver at a first location;

calculating a distance from said first location at which reflection by a reflecting surface of a signal transmitted from said mobile object will cause the received power level at said first receiver to drop below a predetermined level to define a first detection area;

determining a position for each subsequent receiver by calculating a distance at which reflection from a reflecting surface will cause the received power to drop below said predetermined level to determine a detection area and positioning said subsequent receiver at a distance from the previous receiver such that the detection area of the subsequent receiver overlaps with the detection area of the previous receiver to form a continuous strip within which the signal from the transmitter is receivable by at least one of the receivers;

providing means whereby the signal received by said at least one receiver can be provided to said stationary location; and

providing means to determine the position of said mobile object using indications other than parameters of the received signal and carrier and to control switching between receivers on the basis of the determined position.

14. A method of establishing a communication system according to claim 13 wherein said reflecting surface is the ground.

15. A method of establishing a communication system according to claim 13 wherein the position of each receiver is determined by:

determining a first zone of possible positions for the receiver based on a predetermined amount of overlap of the detection areas of the current receiver and the previous receiver;

determining a subset of the first zone of possible locations for the receiver to determine a second zone of practical locations for mounting the receiver;

eliminating those locations in the second zone in which the detection area of the receiver does not cover all the required locations of the transmitter by considering the topology of the ground in the detection area of the receiver and any obstructions therein to define a third zone; and

placing the receiver in the third zone.

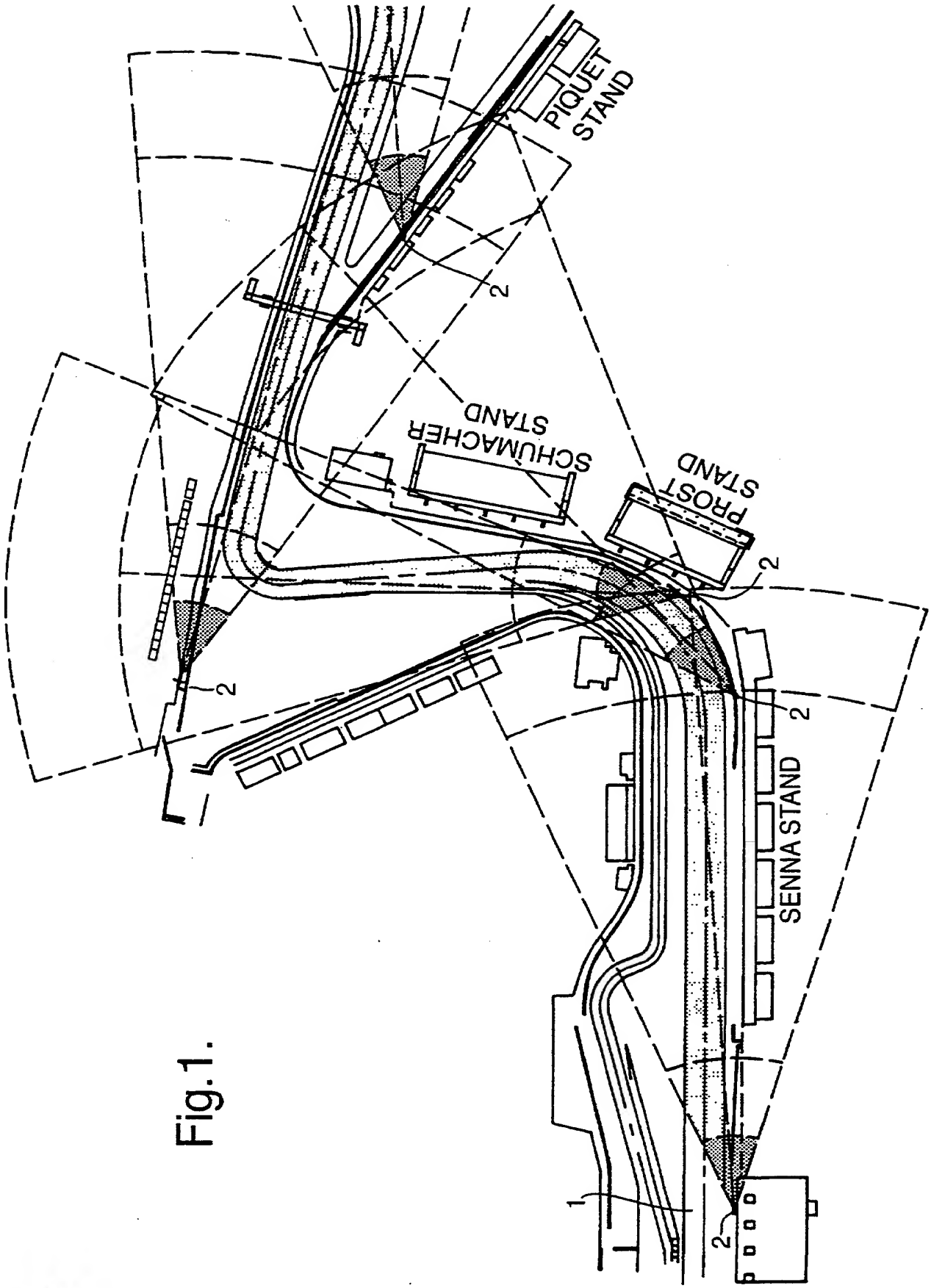
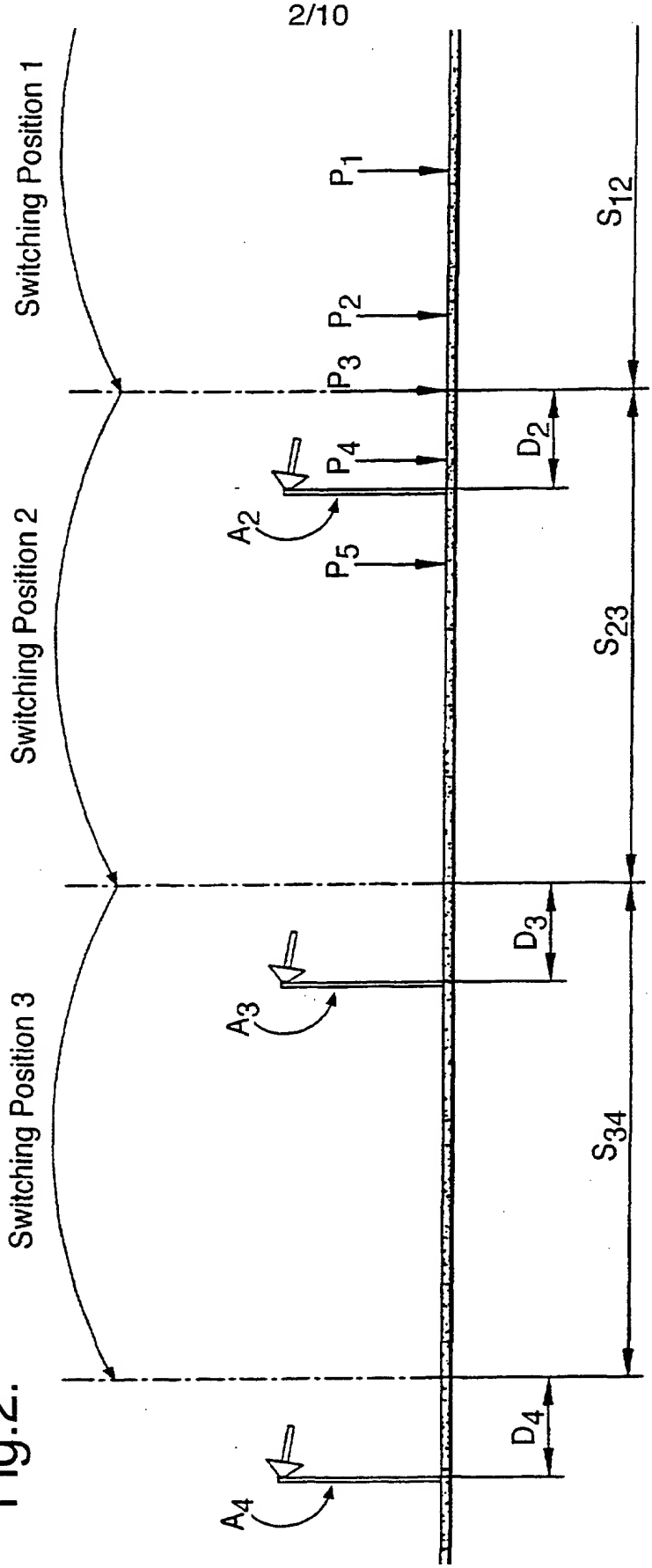


Fig.1.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Switching Position 2
Switching Position 3
P1
P2
P3
P4
P5
A2
A3
A4
D2
D3
D4
S12
S23
S34

Fig.2.

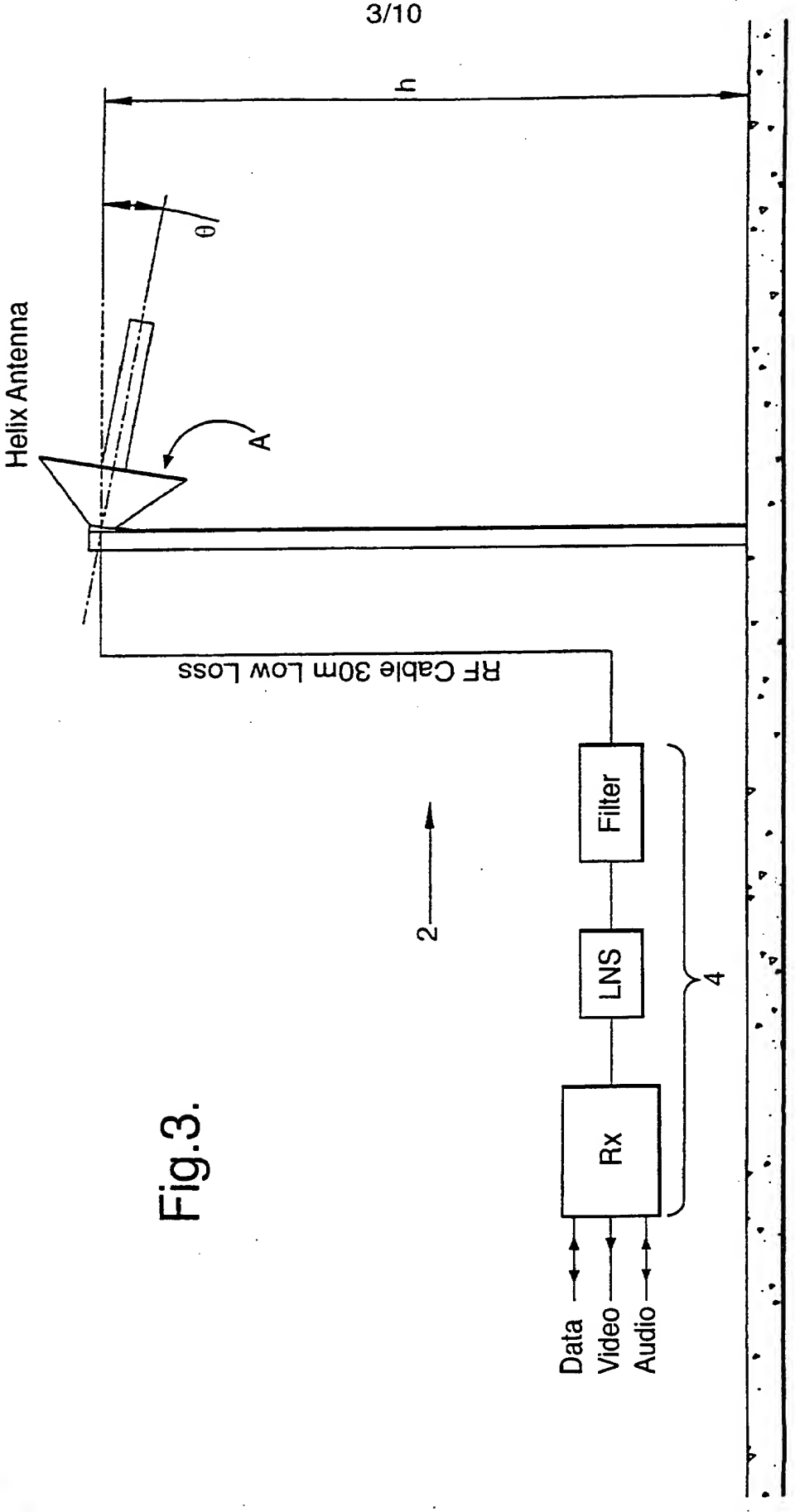

h
θ
Helix Antenna
A
RF Cable 30m Low Loss
Filter
LNS
Rx
4
2
Data
Video
Audio

Fig.3.

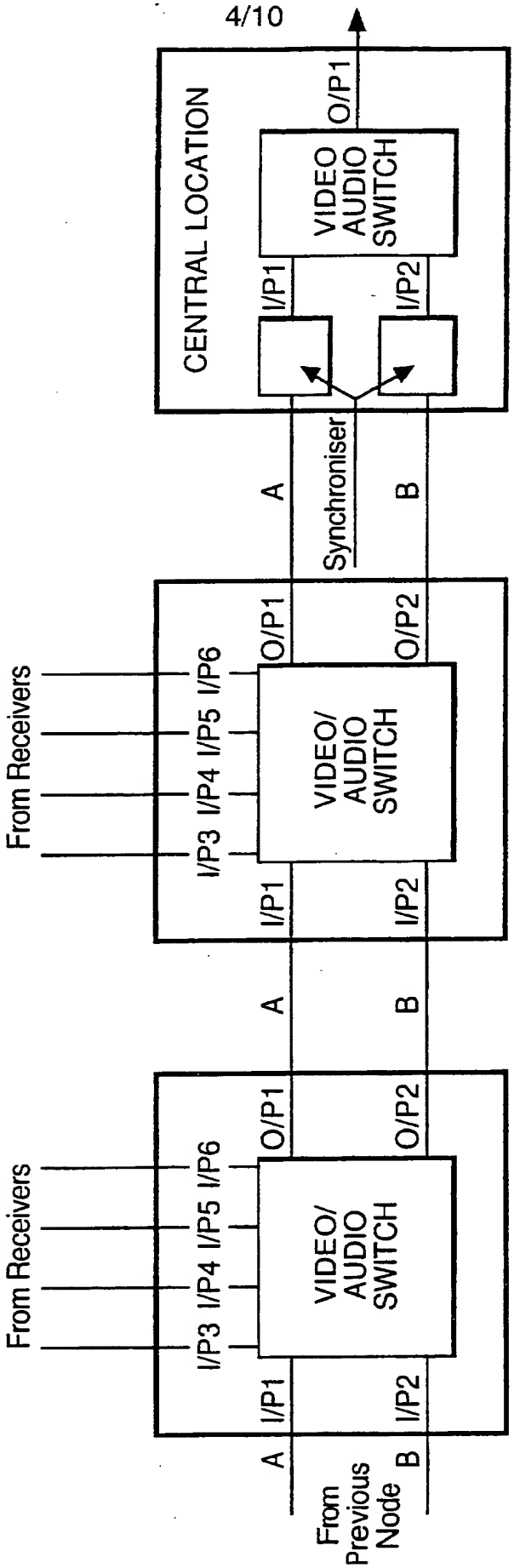

CENTRAL LOCATION
VIDEO AUDIO SWITCH
O/P1
I/P1
I/P2
Synchroniser
A
B
From Receivers
I/P3 I/P4 I/P5 I/P6
VIDEO/ AUDIO SWITCH
O/P1
O/P2
I/P1
I/P2
From Previous Node

Fig.4.

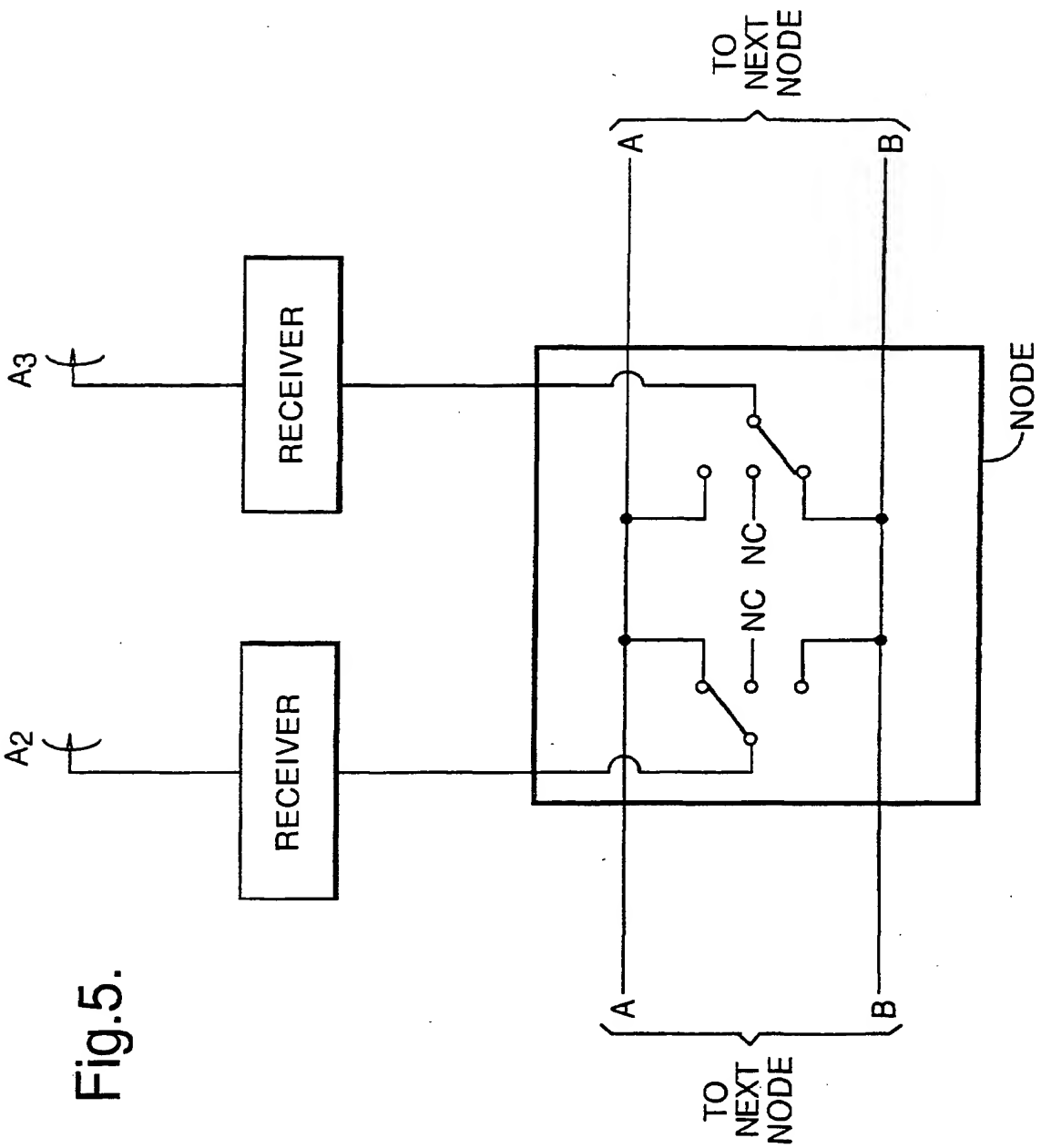

TO NEXT NODE
A
B
A3
RECEIVER
NODE
NC
NC
A2
RECEIVER
A
B
TO NEXT NODE

Fig.5.

Fig.6A.

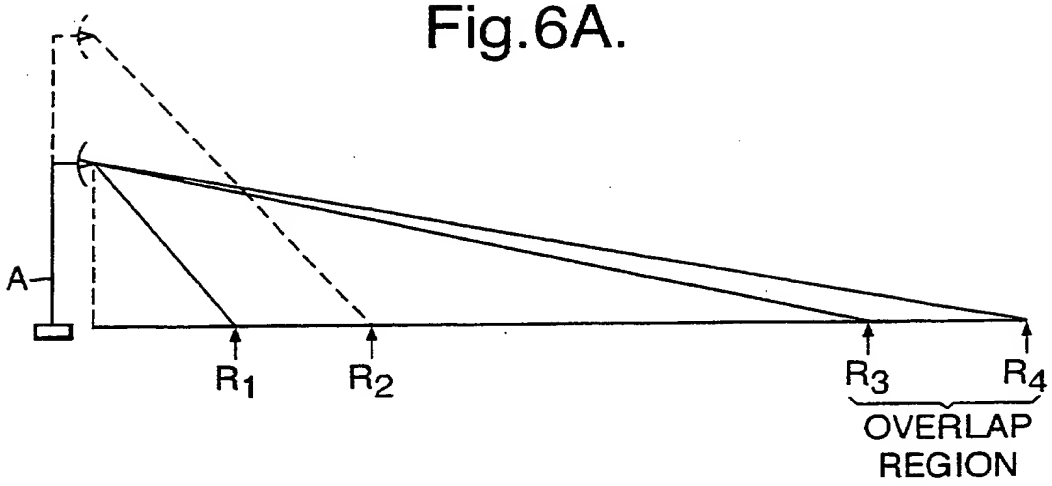


Fig.6B.

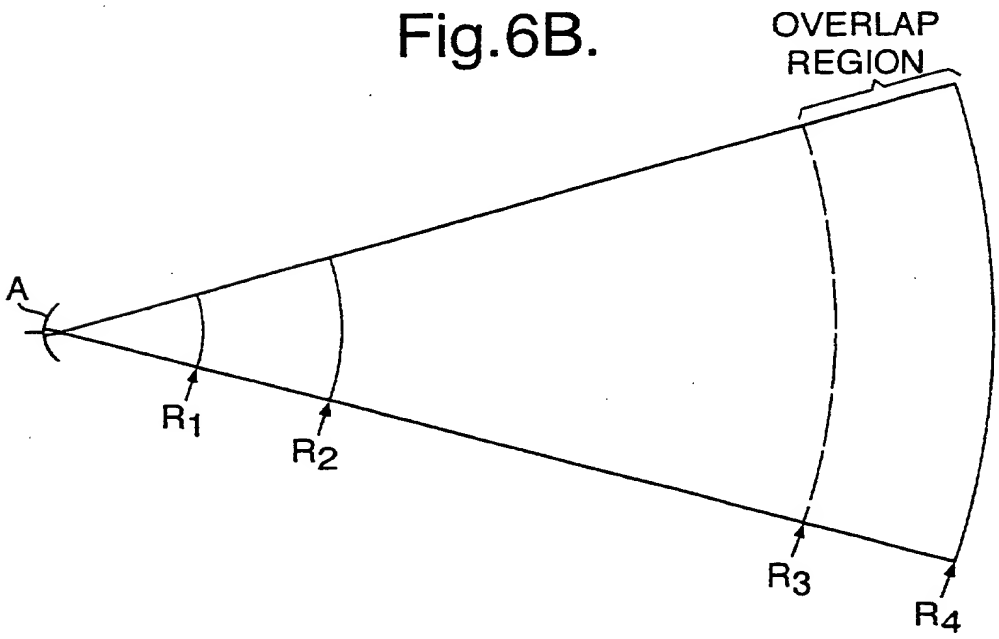
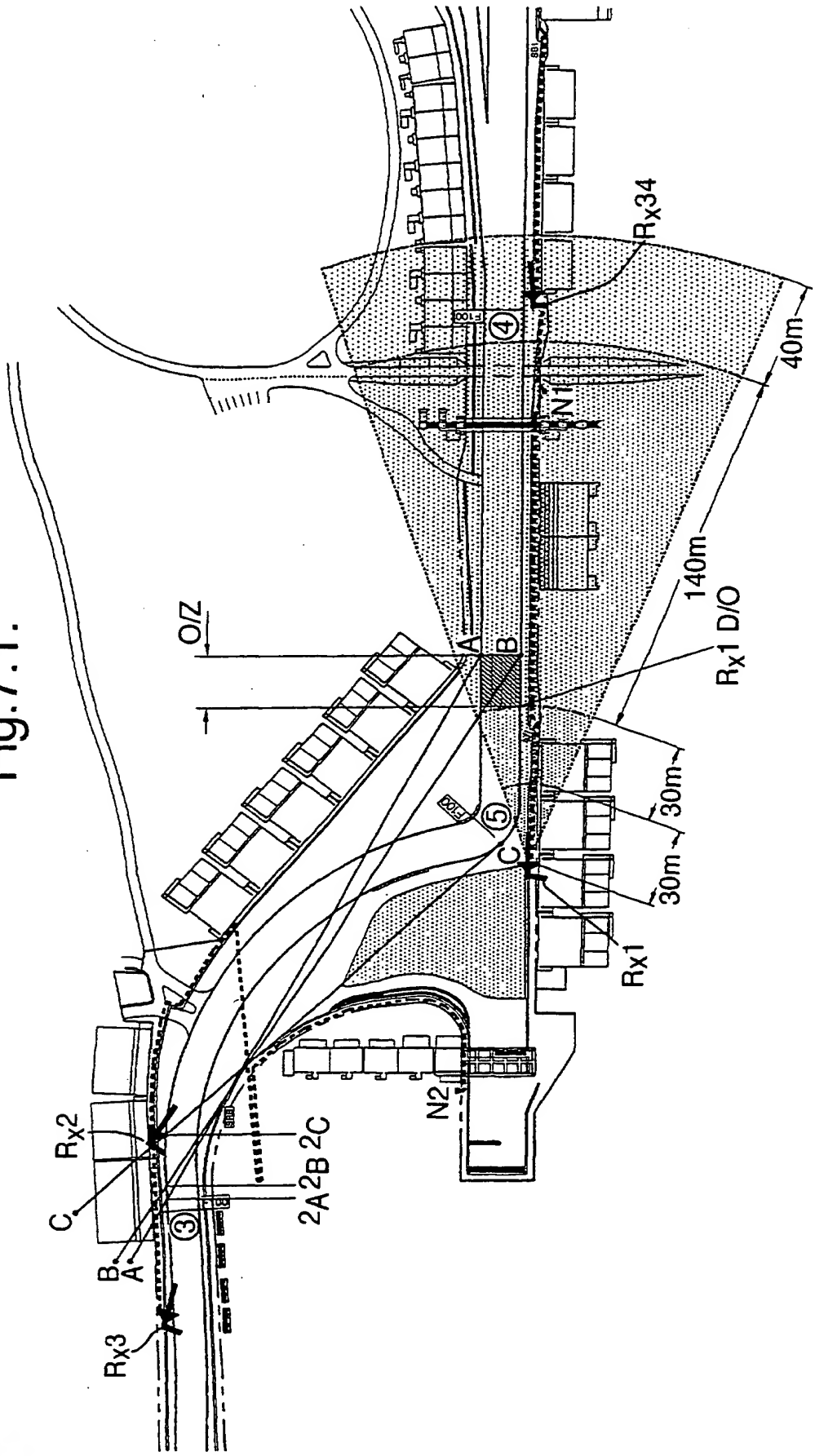


Fig.7.1.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40m
140m
Rx1 D/O
O/Z
A
B
C
30m
30m
Rx1
N1
N2
Rx2
2C
2B
2A
C
B
A
Rx3
③
④
⑤

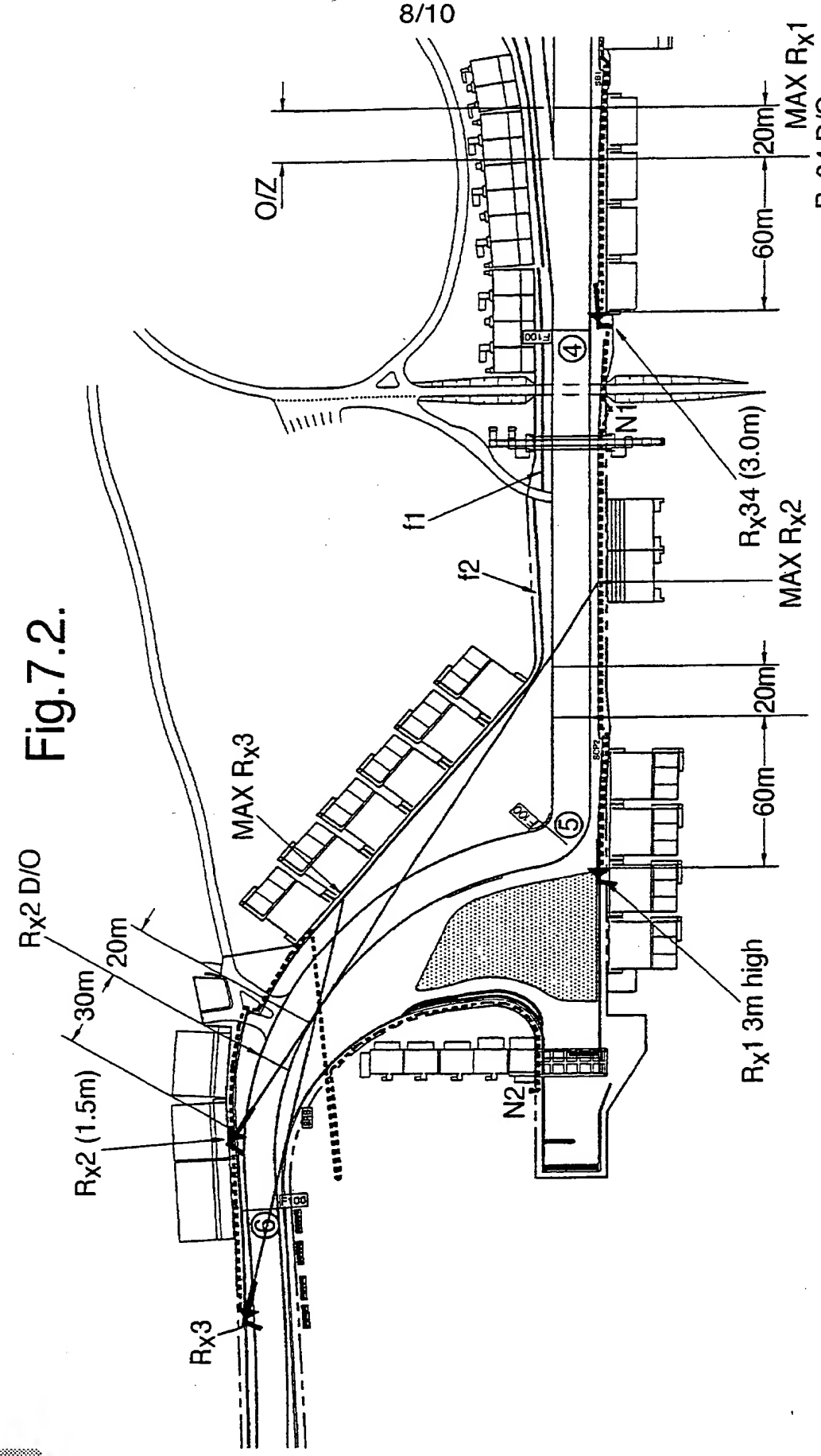

O/Z
MAX Rx1
20m
Rx34 D/O
60m
N1
f1
Rx34 (3.0m)
f2
MAX Rx2
20m
60m
MAX Rx3
Rx2 D/O
20m
30m
Rx2 (1.5m)
Rx3
N2
Rx1 3m high

Fig.7.2.

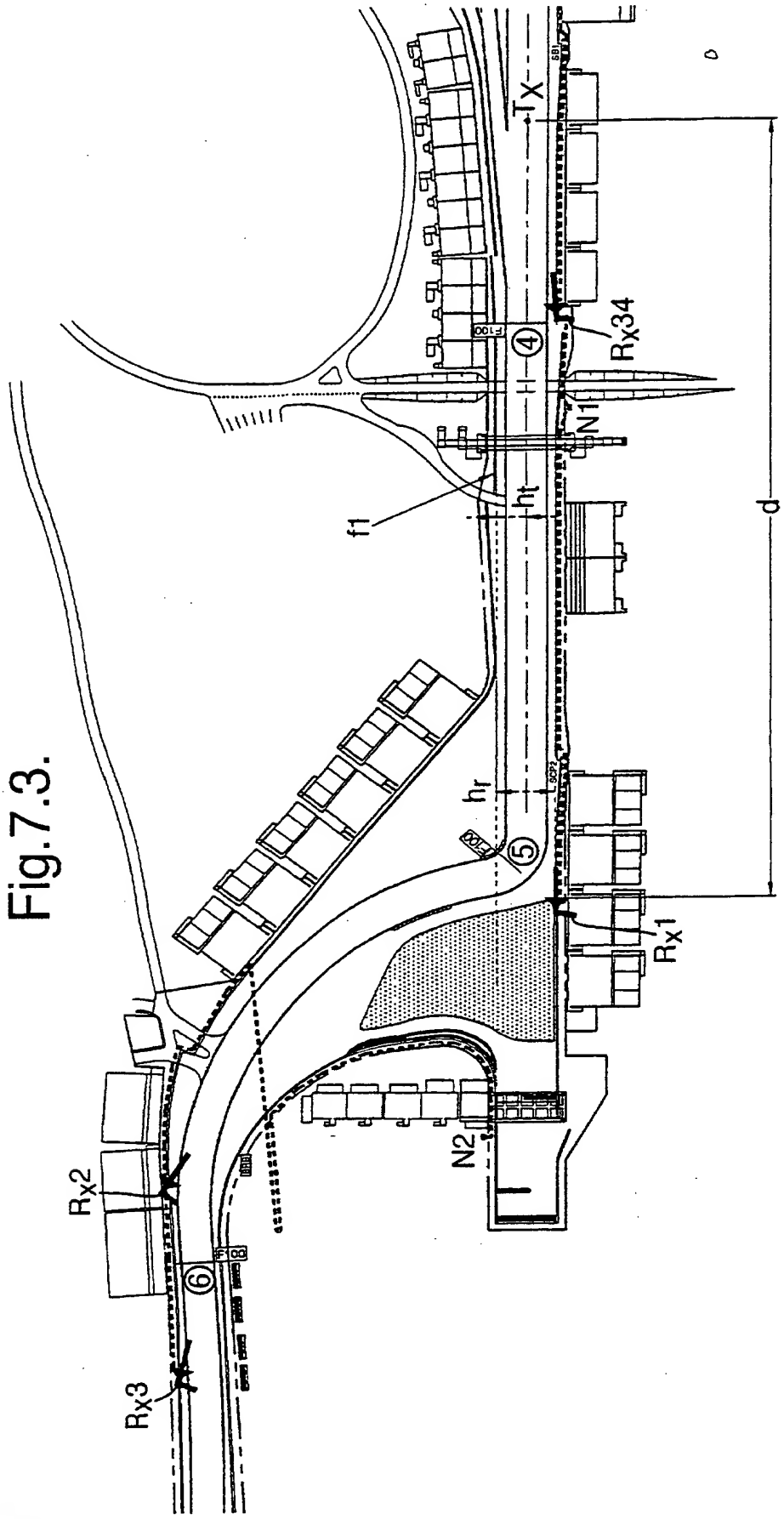
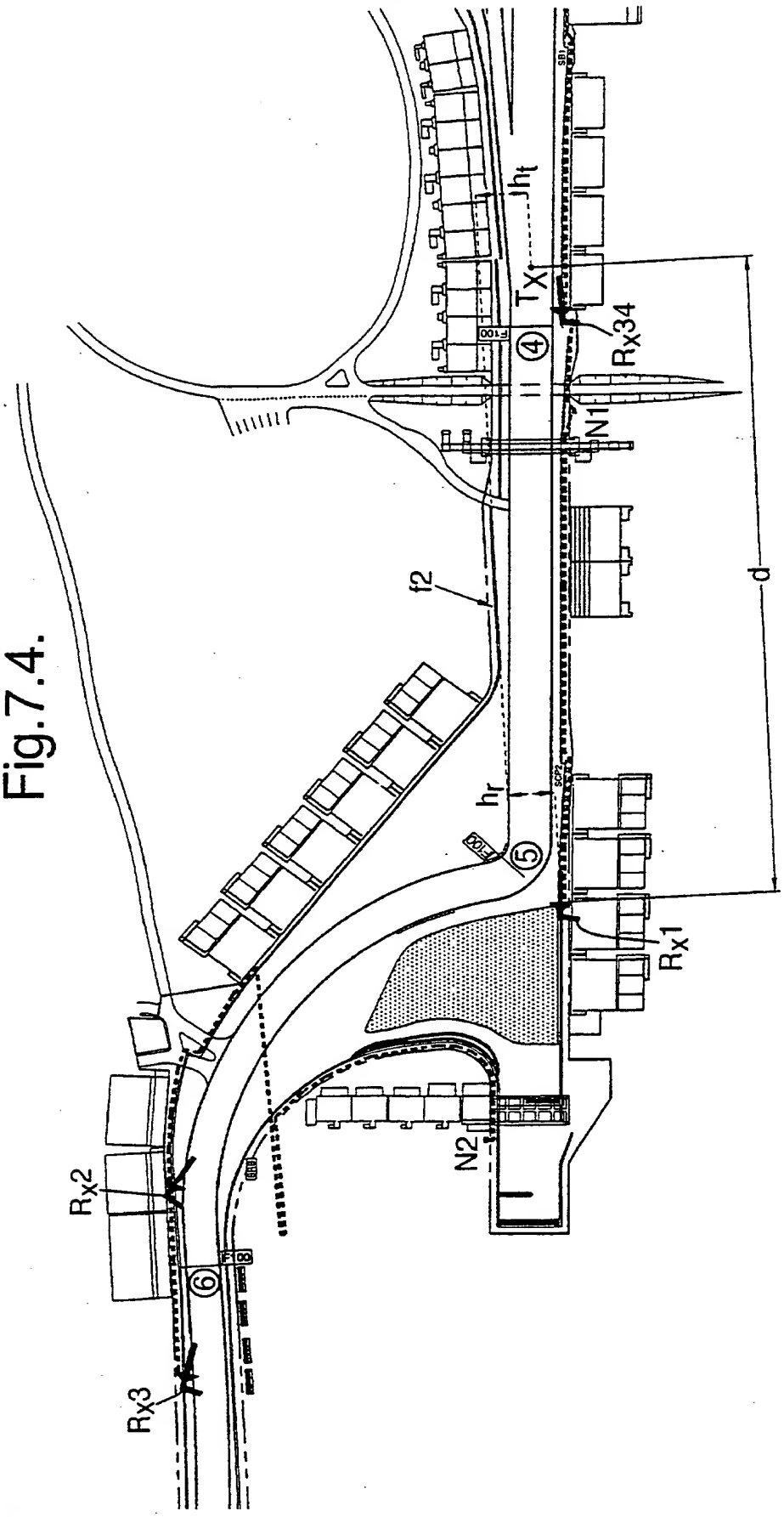


Fig.7.3.

Fig.7.4.



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(74) Agents: LEEMING, John, Gerard et al.; J.A. KEMP & CO., 14 South Square, Gray's Inn, London WC1R 5LX (GB).

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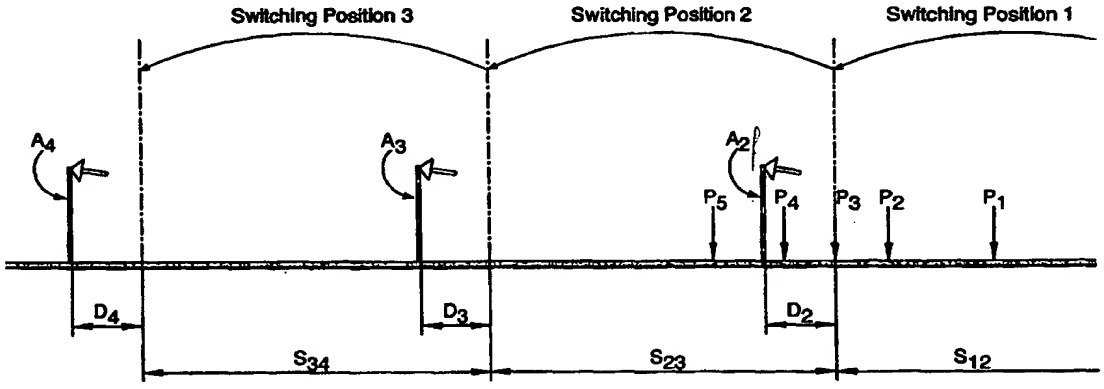
Published

With international search report.

(54) Title: DATA COMMUNICATION SYSTEM



(57) Abstract

The present invention provides a ground based video pick–up system for transmitting video signals produced on a moving object to one of a number of receivers at a fixed position and selecting the desired signal from the most appropriate one of those receivers.

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DATA COMMUNICATION SYSTEM

This invention relates to a system for transmitting data, particularly audio and video signal data, to and from a moving object.

In order to provide real time communication of audio, video and data signals between a moving vehicle and a fixed ground station, the vehicle may be provided with an antenna for beaming a signal to a helicopter located above the car. The helicopter then relays the signal from the car to and from a fixed ground station. This system of communicating data between a moving vehicle and a fixed ground station has been particularly useful in the field of motor racing to provide video, audio and data signals from the cars and to allow data and audio signals to be transmitted back to the car.

Current on-board cameras use a microwave transmitter system for communication up to the helicopter. The helicopter then re-transmits a signal on a second microwave frequency to the fixed location.

There are a number of drawbacks associated with such a system. If a car that is providing the signal does not have a direct line of sight to the helicopter, for example because of tall trees or buildings at the side of the track, then the received

signal may be weak or obscured completely. In such a situation, it is necessary for the helicopter to remain almost directly above the vehicle to maintain a consistent contact with the car. This can be difficult, particularly with high-speed racing such as Formula One where the helicopter is unable to match the speed of the cars it is attempting to follow. Alternatively, the helicopter can fly at a greater height to avoid objects coming between it and the car. However, this again can reduce the signal quality received by the helicopter due to the increased distance. This can also lead to problems with air traffic control. A further problem of using a helicopter to relay signals is its dependence upon the weather. If the weather becomes unsuitable for flight then it is not possible to provide the signal relaying function at all.

A further limitation of the use of helicopters for relaying signals is the limited amount of weight that can be carried to allow the helicopter to remain at its station for the duration of a race. Similarly, there is a limitation on the amount of power that can be provided for running the radio frequency systems.

Therefore, according to the present invention, there is provided: a communication system including:

a video signal source and transmitter provided on a mobile object for generating and transmitting said video signal on at least a first carrier frequency;

at least first and second receivers for receiving said transmitted video signal on said first carrier frequency, said first and second receivers having at least partially

overlapping detection areas and being located at spaced apart locations;

a position detector for generating a position signal indicative of the position of said mobile object using indications other than parameters of the received video signal and carrier;

a controller responsive to said position signal for selecting one of the video signals received by said first and second receivers and outputting said selected signal, said controller being located other than in said mobile object.

According to the present invention there is also provided a method of communicating a video signal between a mobile object and a stationary location comprising:

transmitting the video signal on a first carrier frequency from a transmitter on the mobile object;

providing at least first and second receivers at spaced apart locations for receiving the signal from the transmitter on said first carrier frequency; and

determining the location of said mobile object using indications other than signal parameters of the received signal or its carrier;

selecting the signal received by one of said first and second receivers for output at said stationary location.

The present invention still further provides a method of establishing a communication system for communicating a video signal between a mobile object provided with a transmitter for transmitting the video signal on a first carrier frequency and a stationary location comprising providing a plurality of receivers each having a detection area within which the receiver is able to receive the signal from the

transmitter on said first carrier frequency when the transmitter is in the detection area, the method comprising the steps of:

arranging each receiver by placing a first receiver at a first location to define a first detection area, then positioning each subsequent receiver at a distance from the previous receiver such that the detection area of the subsequent receiver overlaps with the detection area of the previous receiver to form a continuous strip within which the signal from the transmitter is receivable by at least one of the receivers, and wherein the signal received by said at least one receiver is provided to said stationary location.

The present invention is preferably also arranged so that switching between receivers is carried out on the basis of the position of the mobile object. The receivers are preferably arranged so that the area in which they can receive signals at an acceptable level overlaps with the receiver in the corresponding adjacent area.

The transmitters on the mobile object may be arranged to be able to transmit on a number of different frequencies. Similarly, the receivers may also be adapted to receive on a number of different frequencies. The operating frequencies of the transmitters and the receivers are preferably controlled by data messages sent from a central location to the moving objects and receiver stations. Each frequency may be received by a dedicated antenna (i.e. each receiver having its own antenna) or a single antenna and an RF splitter may be used with a proportion of the RF signal being directed to each receiver. The receiver selects the wanted frequency in the RF signal.

The video signal is preferably transmitted from the mobile object to the receivers using a microwave carrier. This is preferably at 2.5 GHz. Other data and

audio signals may be modulated onto the video signal or transmitted on a separate frequency, preferably between 100 MHz and 40 GHz.

The present invention requires only a single frequency to transmit a video signal as there is no re-transmission of the signal as in the case of a helicopter-based system. This allows a doubling in the number of signals that can be transmitted for a given number of frequencies. Furthermore, because the transmission from each transmitter is received by a receiver at relatively close range, the transmission power can be reduced. This also allows the same frequency to be used simultaneously between another transmitter and receiver at a different location. This is not possible with helicopter based systems in which all signals have to go via one helicopter and so only one transmitter could use a given frequency in order to avoid interference.

By providing sufficient receivers to ensure that the signal transmitted is always received by at least one receiver there is never a break in transmission. As the signal is being transmitted substantially horizontally along the ground to a trackside receiver, trees and buildings do not present an obstruction to the signal path.

The receivers are preferably provided in a trackside receiver station. The station preferably includes an antenna and optionally additional receivers.

A specific embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which: -

Figure 1 shows an example of a layout of receiver stations around a section of

racetrack;

Figure 2 shows a representative arrangement of receiver stations relative to each other and the respective switching positions for switching from the receiver in one station to the next;

Figure 3 shows a schematic layout of the arrangement of one of the receiver stations according to the present invention;

Figure 4 shows a schematic layout of the signal relay system of an embodiment of the present invention;

Figure 5 shows a schematic example of a node used in the signal relay system; and

Figure 6 shows an example of the detection range of an antenna.

Figure 1 shows an example of a section of racetrack 1 and a suitable arrangement of receiver stations 2 (referred to herein as stations) around such a section of track to provide continuous reception of a video signal from an on-board camera in a racing car. The embodiment of the present invention described herein relates to a system for providing communication of a video signal from a moving racing car to a fixed location such as an outside broadcast unit. Each station includes at least one antenna and one receiver. This is preferably a directional antenna (e.g. helix antenna) but may be an omnidirectional antenna. The dashed lines in Figure 1 provide an indication of the detection angle of the antenna on each station 2.

The signal received by the antenna is fed to the receiver in the station and then fed back to a controller at a central location where the signal from one of the receivers is selected as the most appropriate. The selected signal is then used to provide the output signal from the system, e.g. for broadcast.

It will be apparent that, by providing sufficient stations around the periphery of the track, as the car travels around the track the video signal transmitted by the car is always receivable by at least one of the stations.

In order to ensure this continuity of reception, there is some overlap in the detection range of one station and its neighbour. This overlap (preferably at least 20m) ensures that as the car travels from the reception area of one station to the reception area of the next station, the car passes through an area where the video signal transmitted by the car is received by the antennas of both stations. At some point in this area, the system switches from using the signal from the first station to using the signal from the next station.

Figure 2 shows a schematic view of a section of a track showing the antennas (A_2, A_3, A_4, etc.) of a number of stations. As the car enters from the right, it first passes position P_1. The antenna A_2 is initially receiving the signal transmitted by the car. As the car continues to the point P_2, the car enters the reception range of the next antenna A_3 at which point the signal being output is received by A_3 as well as by A_2. However, the signal being received by A_2 is still the one being utilised to provide the output signal. As the car passes position P_3, the system switches from using the signal from A_2 to using the signal from A_3 although the signal from the car is still being received by A_2. As the car continues on through position P_4, antenna A_2 eventually

becomes unable to receive the signal from the car so that only antenna A_3 is receiving the signal. This switching procedure is repeated as the car progresses around the track and moves from the reception area of one station to the next. As is clear from figure 2 switching takes place at a distance D_2, D_3 or D_4 before the car reaches the antenna of the station currently providing the video signal which is being utilised. This ensures that a good quality signal is still being received up until the changeover. If the changeover was delayed until the car was level with the antenna, the signal strength received by the antenna may drop off considerably as the car drops out of the optimum reception zone of the antenna.

The exact point at which switching takes place is very important. If switching occurs too early, e.g. at P_2, the strength of the signal received by A_3 may be weak. As described above, leaving switching until too late can result in the signal received by A_2 being too weak. If the received signal is weak then the output signal may be distorted or noisy. However, to determine the appropriate switching point it is not sufficient to simply measure the strength of the signal received by each receiver and then select the strongest of those. This can lead to a misleading indication of the best signal and hence the wrong switching position. One of the reasons for this is interference caused by the transmitted signal arriving at the antenna indirectly, i.e. having reflected off some other object. This phenomenon, known as multipath, results in the direct and indirect signals having taken paths of different lengths to arrive at the receiver. Depending upon the difference in the path lengths, the two signals may constructively interfere, providing a stronger signal, or destructively interfere reducing the signal strength. Furthermore, as the car moves, this difference

between the path lengths may change and so the signal strength may vary between being very weak and being very strong. This variation makes it difficult to use the signal strength as the sole accurate indicator of which receiver to use for the output signal.

The system of this invention determines the appropriate time to change from one receiver to the next based upon the position of the car relative to the antenna. This requires knowledge of the position of the stations and the car. This can be determined in a number of ways. On a racetrack, data may be available from the time keeping system. This allows the position of the cars to be determined accurately at any time. However, there are a number of alternative ways of determining position. Apart from well-known systems such as GPS (Global Positioning System), it would be possible to use a custom system for providing position information, for example by utilising the stations themselves to determine the distance from the car. Even where highly accurate position information is not available, it is still possible to interpolate to provide an estimated position. In a racing track situation, the cars follow fairly predictable position and speed paths, allowing accurate estimation of the car's position.

On a racetrack, which may be several kilometres long, the stations may be a long way away from each other and from the controller at the central location. The simplest way of delivering the signals received by the receivers to the central controller is by directly connecting, e.g. via a cable, each receiver to the controller.

In a motor race, it is desirable to have cameras on more than one car. The system can enable a number of cars to provide video signals, by each car transmitting

on a different frequency. Where two or more cars are in the reception area of the same station, the antenna receives both signals.

This system can be further developed to allow for additional cameras where the number of frequencies available for transmission is limited or if there are a large number of cars in a race. Furthermore it may be desired to have more than one signal being produced from each car (e.g. forward and rearward views or a view of the driver). Under such circumstances a large number of channels may be required. If the bandwidth available is limited, it is possible to utilise the same frequency for signals provided by different cars. This is possible so long as cars transmitting on the same frequency are sufficiently far apart such that the station picking up the signal from one car does not pick up a significant amount of the signal from another car transmitting on the same frequency. This can be achieved by monitoring the position of the cars and where two cars using the same frequency are in danger of coming close enough to interfere with each other the controller will instruct the transmitter on the car to change to a different frequency which is not being used by any other car in close proximity or to stop transmitting. The position information used to determine switching between stations may be used to determine the allocation of frequencies to the transmitters. In this way, several cars at different positions around the track can use the same frequency simultaneously. This represents a considerable advantage over the helicopter-based system that could only utilise a single transmitter per frequency. Furthermore with the present invention each transmitter only uses a single frequency rather than the two required with the helicopter system, i.e. one for transmitting to the helicopter and one for the relay to the ground based receiver.

Having a separate connection between each receiver and the central controller leads to a large number of potentially very long cables between the receivers and the central controller. Therefore, in an alternative embodiment of the present invention there is provided a common "bus" system to which all receivers are attached. In its simplest form, this comprises two connections: an A-line and a B-line, each line being capable of carrying a video signal. These two lines are arranged to connect the central location and each of a number of nodes. However, instead of the line going from the central location to each node, the lines connect from the central location to the first node and then from the first node to the second node and so on until the last node which is preferably connected back to the central location to form a ring. Each receiver may have its own node or a node may be provided for more than one receiver. For example, for a set up comprising twenty receivers, five nodes may be provided with four receivers connected directly to each node.

Figure 5 shows an example of a node to which two receivers in two stations receiving the signals provided by antennas A_2 and A_3, are connected. As is shown schematically in Figure 5, signals from each receiver can be connected either to the A-line, the B-line or to neither line (NC). Referring to Figure 2, as the car arrives at the position P_1 the signal transmitted by the car is being received by a A_2 which, as is shown in Figure 5, is connected to the A-line. The received signal is then passed back down the line from node to node until the signal is received at the central location. As the car continues on past P_2, the signal transmitted to the car is then receivable by A_3 and the switch in the node connects the signal provided from the receiver for antenna 3 to the B-line. The received signal from A_3 is then passed from node to node

down the B-line, again back to the central location. Thus, between positions P_2 and P_4 the central location is provided with two video signals corresponding to the signals received at antennas A_2 and A_3. As shown in Figure 4, the central location is provided with switching means. The switching means outputs the video signal provided on the A- or the B-lines according to a control signal provided by a controller. In this embodiment the control signal comprises data messages sent from control software operating on a computer. The software selects which of the video signals on the A-line and B-line is output. Therefore, initially, the software controls the switch to provide an output signal from the A-line, then as the car passes point P_3, the software sends a message to the switcher so the output corresponds to the signal being received on the B-line (i.e. that received by antenna A_3).

Two synchronisers are employed to ensure the sync pulses of the video signals on the A-line and B-line are coincident. When a switch command is sent, the switcher waits until the next vertical blanking interval of the current video signal and then switches between the A-line and the B-line, or vice versa. In order to avoid image distortion, such as frame roll, when switching between the signals output by one receiver and the next, a frame memory may be employed. The use of a frame memory avoids any problems due to the frames in the two signals not being synchronised.

As the car continues on, the signal from A_2 will be lost. Then as the car comes within the range of A_4, the node to which A_2 is connected will disconnect A_2 from the A-line and the node to which A_4 is connected will connect the signal received by A_4 to the A-line so that both the A-line and the B-line are relaying signals received

from the car. Again, at the appropriate time, the software sends a message to the switcher in the central location to switch from outputting the signal on the B-line to outputting the signal on the A-line (which corresponds to the signal received by A_4). This process is repeated as the car continues around the track with the A-line and B-line alternatively providing the output signal. The exact timing of the disconnection of one receiver (e.g. A_2) and the connection of the next receiver to the same line (eg A_4) is not essential as long as the signal on that line is not being utilised. For example, the disconnection of A_2 from the A-line may be as soon as the signal received by A_2 is too weak or it may be delayed until the time at which the signal from A_4 is sufficiently strong.

Figure 5 indicates that once the RF signal has been received it is converted back to a baseband video signal. The A-line and the B-line are therefore independent of the received frequency and hence can be used to provide transmission of video signals from more than one car. However, the A/B Line pair are only capable of transmitting the two video signals required when following a single car around the track. Thus, in order to make use of the possibility of following two different cars around the track, a separate pair of lines e.g. a C-line and D-line can be provided.

Again, because the C/D-line pair are independent of frequency they can be used in the transmission of video pictures from a car transmitting on any frequency within a specified receiving band. The second car may be transmitting on the same frequency as the car being followed by the A/B-line pair. However the cars are required to be at different locations around the circuit so that the RF signals reaching the receiver from the two cars do not interfere with each other.

Thus the addition of extra line pairs allows an increase in the system capacity by one car. Further pairs (E/F-line, etc.) may also be added to allow third and further cars to be followed around the track. It is however, still possible to have several cars transmitting at the same time around the track without having a second (C/D-line) system. It is however only possible to relay the signal from one of those cars at a time with the signals received by other antennas from other cars not being connected to the A or B-lines.

Alternatively, if two cars using the same frequency become too close to each other on the track then one of these cars could be sent a message to change its transmission frequency, thus avoiding interference.

In an alternative embodiment of the present invention the receivers may be connected to a network (e.g. LAN). The network may link all the receivers or just a proportion of them in conjunction with other networks. In this way, the central controller can instruct which receivers should send their received signals.

The layout of the receiver stations around the track requires careful planning to provide the required coverage with the optimum number of stations. In theory it would be possible to simply place a large number of stations at regular intervals around the track to ensure that the signal transmitted by the car can be detected by at least one of them at all positions on the track. However, such a layout introduces other problems into the system. If stations are placed too close together then, apart from the unnecessary additional cost of having more stations than necessary, the complexity of the switching and controlling system is increased because the signal from a transmitter may be picked up by several antennas. Equally having too few

base stations may leave areas of the track where only a poor quality or no signal can be received. Therefore, in order to achieve consistent coverage of the entirety of the track, with the minimum number of receivers, the receiver stations are laid out as follows.

A typical helix antenna provides a detection area (or receive envelope) which is a 30° segment of a circle with a maximum range of around 200 metres. The receive envelope cut off area is from 30 to 60 metres depending on the height of the antenna above the ground (from 1.5 metres to 3 metres respectively).

The 30 degree segment of a circle is described as the beamwidth of the antenna and is a specification supplied by the antenna manufacturer. The maximum range is determined by the maximum distance at which the received power level is sufficiently high to produce broadcast quality video signal. The minimum receive power level used for broadcast quality pictures is -60dB.

The receive envelope cut off area is the distance in front of the antenna at which the video signal breaks up. The break up in the video picture is caused by a drop in the received power level resulting from cancelling of the direct signal by a reflection of the same signal off the ground. The distance at which this occurs is dependant on the height of the transmit antenna and the height of the receive antenna above the ground. The frequency of the RF signal will also change the location of the cut off point. The amount of reflection and hence its effect depends on the surface over which the wave is travelling as well as upon the wavelength of the signal. The

following reflection equation can be derived:

$$\text{Received Power} = 4P \sin^2\left(\frac{2\pi h_r h_t}{\lambda d}\right)$$

Where P is the received power without reflection i.e. under free space conditions, h_r and h_t are receiver and transmitter heights relative to the reflection surface and d is the distance between the receiver and transmitter. The reflection surface may not be the ground. For instance it may be a wall or barrier. In this case the values h_r and h_t refer to the distance between the reflection surface and the respective antennas.

Analysis of the reflection equation indicates that to maximise the receive envelope close to the antenna, it is preferable to mount the antenna low to the ground. However, the RF signal is attenuated as the antenna becomes closer to the ground which reduces the maximum distance of the receive envelope. The attenuation is the result of the ground entering the first Fresnel zone. Fresnel zones surround the direct ray path between the transmitter and receiver. The first Fresnel zone refers to the zone immediately surrounding the direct ray path. This zone is defined in such a way that the path length of a ray which has been deflected between the transmitter and receiver is within half a wavelength of the path length of the direct ray. As the largest part of the signal power passes through the first Fresnel zone, any object, including the ground, aligning within this zone will lead to attenuation of the received signal. A compromise is therefore made when mounting

the antennas. Usually at a Grand Prix circuit the track is surrounded by metal barriers, known as Armco, which are approximately 1 metre high or with fencing which is approximately 3 metres high. Antennas are mounted half a metre above the Armco so that the RF Signal is not attenuated by being located near to the metal structure or the tyre wall in-front. Therefore, because the antennas are mounted by these track features, the most common mounting heights for the antennas are 1.5 metres and 3 metres. The mounting requirements for each site are determined by reviewing the physical layout of the site at that point and determining limiting factors which may prevent optimum locations of each circuit or conducting an on the spot circuit review.

Having determined the height of the antenna, the receive envelope, which lies between the outer limit of the antennas range (R_4 - see Figure 6) and the inner limit (R_1, R_2) determined by the point at which signal drop out occurs, can be determined. Having determined this receive envelope, it is necessary also to establish the amount of overlap with the receive envelope of the antenna of the adjacent station to ensure a smooth transition from using the signal from one station to using the signal from the next station. Thus, a range R_3 corresponding to the point at which the signal from the adjacent antenna can no longer be received is chosen defining an overlap region between R_3 and R_4.

In practice, in order to determine the layout of the stations around a track, the position of the first station (Rx1) is selected at the end of a long, for example, the Start/Finish straight (see Figure 7.1). The performance of this site is then established, the results of which enable the station previous (Rx 34) to the current station (Rx1),

and the subsequent station (Rx2) to be located.

In Figure 7.1, Rx 1 is mounted at 3 metres high, therefore, using the reflection equation, the drop out point for the site will be 60 metres in front of the antenna. The operation of the system is based on an optimum overlap zone between the receive sites of 20 metres, this allows for fluctuation in vehicle position at the point at which the video is switched. If accurate position information is not available then the overlap zone can be increased to avoid the possibility of the signal being lost by switching from one receiver to the next too soon or too late. This 20 metres is added onto the drop out point and establishes the point on the track at which the subsequent station must be providing clean pictures (points A and B).

A line is then projected from the subsequent station pick up point on the inside of the track (point A), in the direction the cars travel, onto the perimeter fence at the maximum possible distance around the track. The projected line should provide a clear line of sight from the transmitter to the receiver and should therefore not cross any defining boundary lines such as perimeter fences, buildings, trees or other structures. Once completed the process should be repeated to the point on the outside of the track (point B). As can be seen in Figure 7.1 the resulting site location may be different to that already determined. It should also be noted that if the receive station was located at position A on the perimeter fence then a clear line of site to pick up point B could not be achieved because of the perimeter fence on the inside of Turn 2.

The location determined through this process then has to be evaluated for providing a clear line of sight for the duration of the planned receive envelope.

Figure 7.1 indicates that location C on the perimeter fence is the maximum distance around the track at which a clear line of sight to point C on the track could be obtained. This therefore implies that neither locations A or B are suitable for the receiver station. The final check is to ensure that location C still provides a clear line of site to the required pick up point. Once confirmed, then the ideal geometrical location of the receive station can be fixed. The effect of the surrounding structures in causing the RF signal to be reflected into the receiver station must then be determined using the reflection equation.

The effect of the surrounding structures to cause destructive reflections at receiver station RX1 must be established before the location of the preceding station (RX34) can be determined. Once the maximum pick up distance for receiver station RX1 has been established then the preceding site must be located to have a drop out point 20 metres below the distance (to ensure the correct amount of overlap). In Figure 7.2 the preceding station to RX1 is shown as being mounted at 3 metres high and therefore must be located a further 60 metres below the drop out point. Figure 7.2 also indicates the procedure for locating the subsequent site to receiver station RX2.

Figures 7.3 and 7.4 indicate how the reflection equation is applied in a practical environment. It can be clearly seen in both figures that the receive antenna height (relative to the reflecting plane - in this case the fence) is a constant value. In Figure 7.3 the fence under investigation (FENCE 1) is parallel to the direction of travel and hence the height of the transmitter also remains at a constant distance. For Figure 7.3 the only variable becomes the transmission distance as the transmitting

vehicle moves closer to the receive station. In Figure 7.4 it can be seen that the height of the transmit antenna will change as the transmission distance changes, therefore, two variables exist. Application of the reflection equation becomes more complicated when performing calculations relating to curved fences (as for example would be required in establishing the performance of receive station RX3 in the figures). In this case the height of the receive antenna relative to the fence would also change continuously as transmission distance changes, and therefore the equation includes three variables.

It should be noted that the drop out distances produced by the reflection equation calculations can be very sensitive to small changes in antenna height relative to the reflective plane. For example, if the height of the transmitter was 4 metres and the height of the receiver 5 metres the first drop out point would occur at 333 metres (assuming the transmission frequency was 2.5 GHz). If the transmitter height was increased to 4.5 metres the first drop out point would become 375 metres. From this brief calculation it can be derived that if the vehicle follows a different path around the track, then the manner in which reflections from the surroundings affect the receiver station performance could vary greatly. It also indicates the importance of accurate location information to ensure theoretical system planning is as accurate as possible.

A further item to consider in the application of the reflection equation is the term relating to the RF signal wavelength and hence frequency. If, using the first example above, the frequency was lowered to 2.4 GHz then the first drop out point would occur at 320 metres, a difference of 13 metres. From this it can be derived that

the set-up of the system would be different depending on the transmission frequency.

Having determined the theoretical locations for the receiver stations, using the appropriate RF equations, it is then also possible to consider the logistical implications of installing the stations. Factors such as position of perimeter openings, general accessibility, cable distances between receiver sation and node, location of advertising sign boards, location of structures to which antennas can be mounted, safety of site location.

For example, Figure 7.2 shows that receiver station RX34 is connected to Node 1 (N1). The cable run is about 40 metres which would be relatively quick to pull out, but there is a track access point just before the site, so a trench would need to be dug and the cable buried for protection of the cable and to keep the access way clear. The site could not be located just before the access point because the stagger in the fence would block the antenna, therefore the receiver station could be moved back to approximately the same location as Node 1 making the cable run short and easy. The net result would be to increase the overlap with station RX1, but to reduce overlap with station RX33. As this example indicates all important factors must be considered as early in the planning stage as possible, and where possible flexibility for minor adjustments should be built into the planning of the system.

The above method of sighting the receiver stations relates to stations provided with antennas having a narrow detection range (eg. 30°). However, these principles can be applied using antennas having a larger detection angle.

Each station comprises at least one receiver. Each receiver may have its own dedicated antenna or the station may have a single antenna and a splitter for

separating the various frequencies received and sending them to respective receivers. The stations also include filters and de-modulators 4, for extracting the video signal from the received microwave transmission. The video signal may then be sent to the central controller as a baseband signal which includes the video picture information and the audio signals modulated onto separate sub-carriers. Alternatively, the system may send the actual signal received by the antenna stations, i.e. the microwave signal, back to a central location where the receiver units and demodulator would be located. This type of system would require the RF signal to be modulated onto the fibre optic transport system, and each site would preferably have a dedicated fibre link back to the central location.

The antennas are preferably helix antennas but these may be replaced by any other type of suitable antenna (such as fan-beam antennas, patch antennas or omnidirectional antennas depending upon their location and the layout of the track. For example, an omnidirectional antenna may be used to cover a bend whilst a directional antenna is used for straighter sections. The directional antennas preferably have an angular range of between 30° and 120° depending on their location.

Whilst this invention has been described in relation to a racetrack location, it is clearly applicable to other applications. The system is equally applicable to a non-closed track e.g. for a road race. Furthermore, the system could be used in any situation where the transmission of video (or other high bandwidth signals) from a moving object to a stationary object is required. Applications could include transmitting pictures from bicycles or cars (e.g. police cars) to roadside receivers for transmission to other police cars or a central control room. The system could even

be extended to provide a mobile video communication system.

Whilst the above described embodiment refers primarily to the communication of video data, it is intended that the system may also provide communication of audio and data signals both to and from the car as well as video signals back to the car. Clearly, once a communication link is established, as described above, it is simply a matter of sending a signal to the car down the established link rather than receiving from it.

CLAIMS

1. A communication system including:

a video signal source and transmitter provided on a mobile object for generating and transmitting said video signal on at least a first carrier frequency;

at least first and second receivers for receiving said transmitted video signal on said first carrier frequency, said first and second receivers having at least partially overlapping detection areas and being located at spaced apart locations;

a position detector for generating a position signal indicative of the position of said mobile object using indications other than parameters of the received video signal and carrier;

a controller responsive to said position signal for selecting one of the video signals received by said first and second receivers and outputting said selected signal, said controller being located other than in said mobile object.

2. A system according to claim 1 wherein the controller changes from receiving the signal received by said first receiver to said second receiver when said mobile object is at a pre-determined distance from said first receiver.

3. A system according to claim 1 or 2 wherein the first and second receivers have helical antennas.

4. A system according to claim 3 wherein said antennas are arranged at a height in the range of from 1.5 to 3 metres relative to the ground.

5. A system according to any one of claims 1 to 4 wherein the transmitter can be controlled to transmit selectively on a plurality of frequencies.

6. A system according to claim 5 wherein the transmission frequency of the transmitter is controlled by the controller.

7. A system according to any one of the preceding claims wherein said position detector determines the position of said mobile object based on information provided by the timing system of a race track.

8. A system according to any one of the preceding claims comprising at least one further transmitter provided on at least one further mobile objects, each transmitter simultaneously transmitting video signals to one or more of said receivers.

9. A system according to any one of the preceding claims wherein the receivers and the controller are interconnected by a network.

10. A system according to claim 9 wherein:

the network comprises first and second signal lines;

the output of each of the receivers is selectively connectable, under the control of said controller, to the first, the second or neither of said signal lines such that, in use, the output from one of said receivers is connected to the first signal line and the output of a second one of the receivers is connected to the second signal line; and

said control means outputs the signal on the signal line connected to the

receiver receiving the desired signal.

11. A system according to claim 10 wherein the control means includes a further output connected to the signal line not connected to the desired receiver.

12. A method of communicating a video signal between a mobile object and a stationary location, the method comprising the steps of:

transmitting the video signal on a first carrier frequency from a transmitter on the mobile object;

providing at least first and second receivers at spaced apart locations for receiving the signal from the transmitter on said first carrier frequency; and

determining the location of said mobile object using indications other than signal parameters of the received signal or its carrier;

selecting the signal received by one of said first and second receivers for output at said stationary location.

13. A method of establishing a communication system for communicating a video signal between a mobile object provided with a transmitter for transmitting the video signal on a first carrier frequency and a stationary location comprising providing a plurality of receivers each having a detection area within which the receiver is able to receive the signal from the transmitter on said first carrier frequency when the transmitter is in the detection area, the method comprising the steps of:

arranging each receiver by placing a first receiver at a first location to define a

first detection area, then positioning each subsequent receiver at a distance from the previous receiver such that the detection area of the subsequent receiver overlaps with the detection area of the previous receiver to form a continuous strip within which the signal from the transmitter is receivable by at least one of the receivers, and wherein the signal received by said at least one receiver is provided to said stationary location.

14. A method of establishing a communication system according to claim 13 wherein the position of each receiver is determined by:

determining a first zone of possible positions for the receiver based on a predetermined amount of overlap of the detection areas of the current receiver and the previous receiver;

determining a subset of the first zone of possible locations for the receiver to determine a second zone of practical locations for mounting the receiver;

eliminating those locations in the second zone to define a third zone in which the detection area of the receiver does not cover all the required locations of the transmitter by considering the topology of the ground in the detection area of the receiver and any obstructions therein; and

placing the receiver in the third zone.

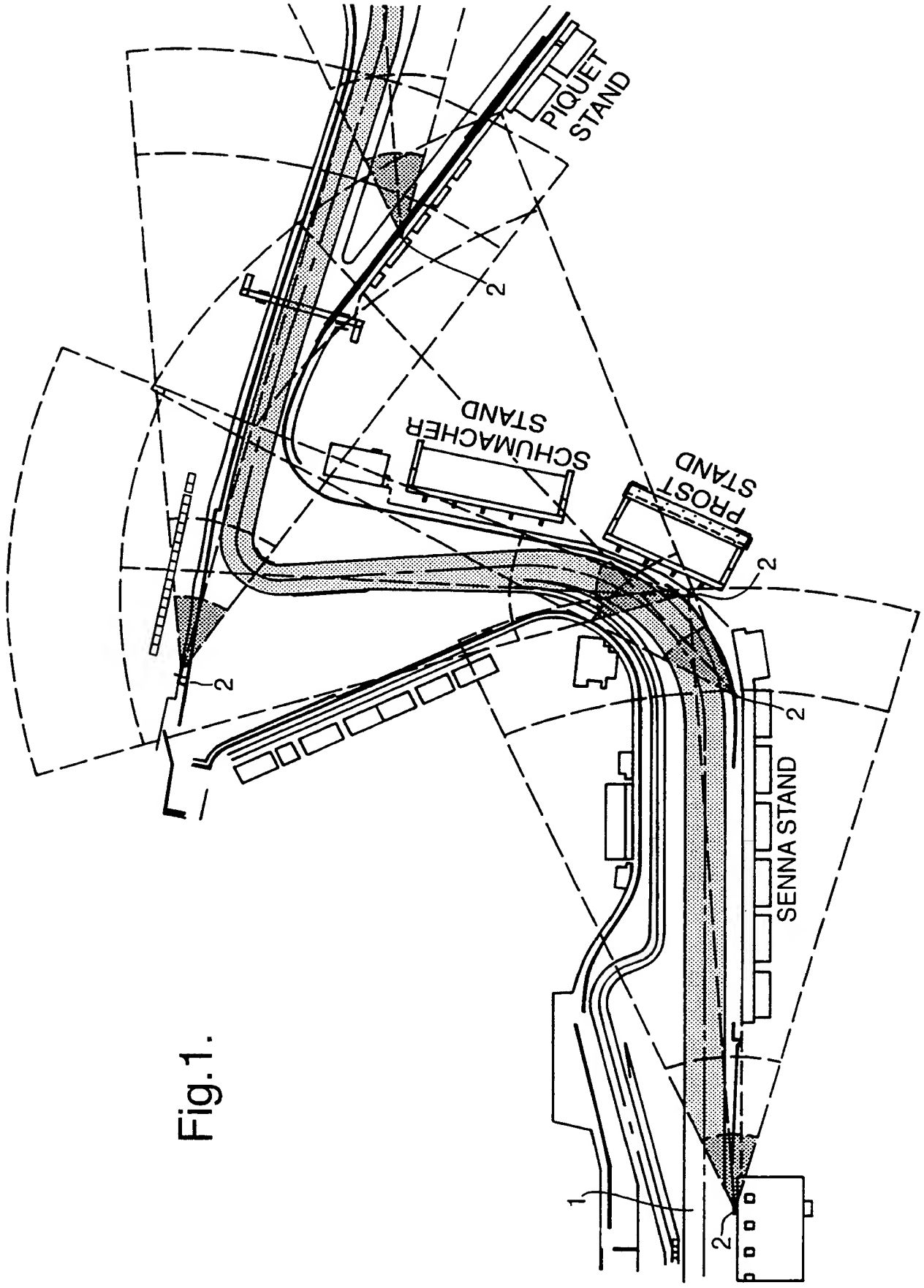

PIQUET STAND
SCHUMACHER STAND
PROST STAND
SENNA STAND
1
2
2
2
2
2

Fig.1.

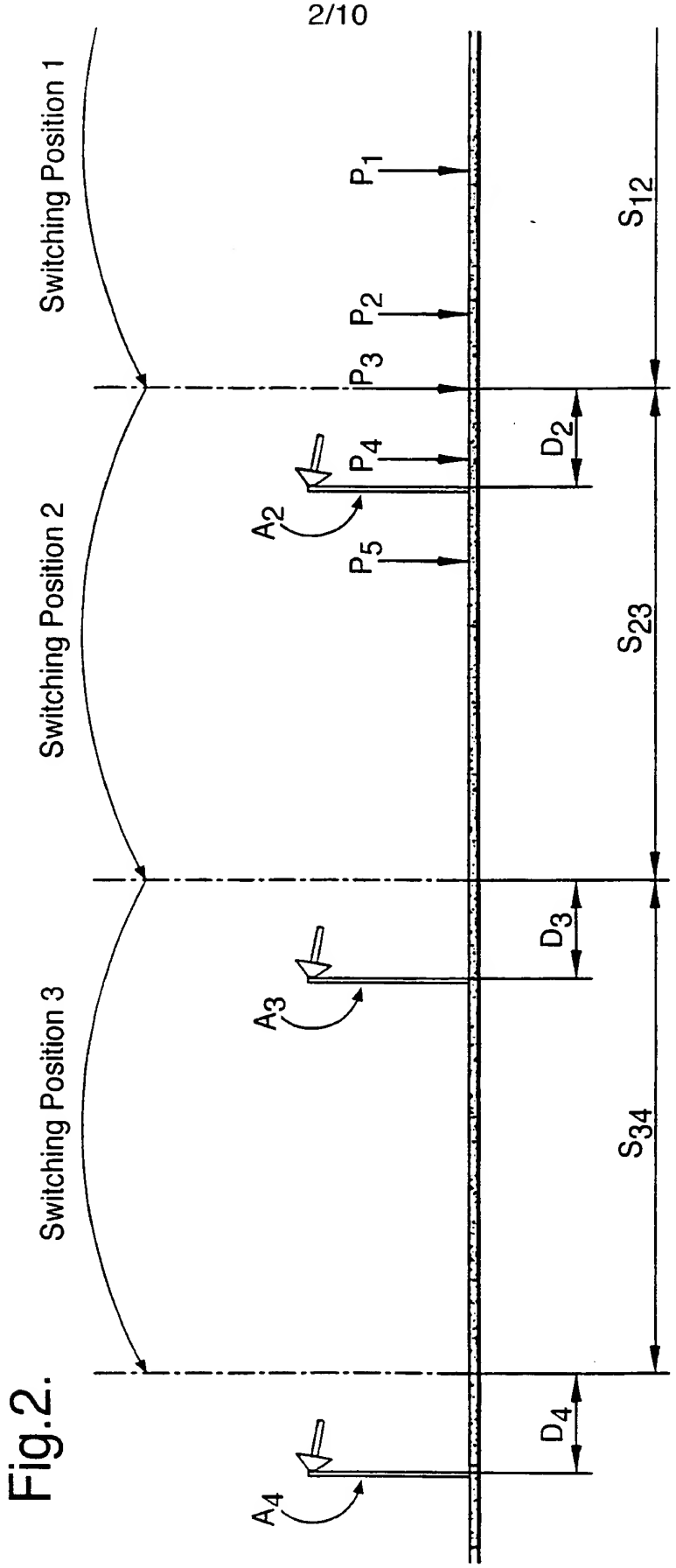

Switching Position 1
Switching Position 2
Switching Position 3
P1
P2
P3
P4
P5
A2
A3
A4
S12
S23
S34
D2
D3
D4

Fig.2.

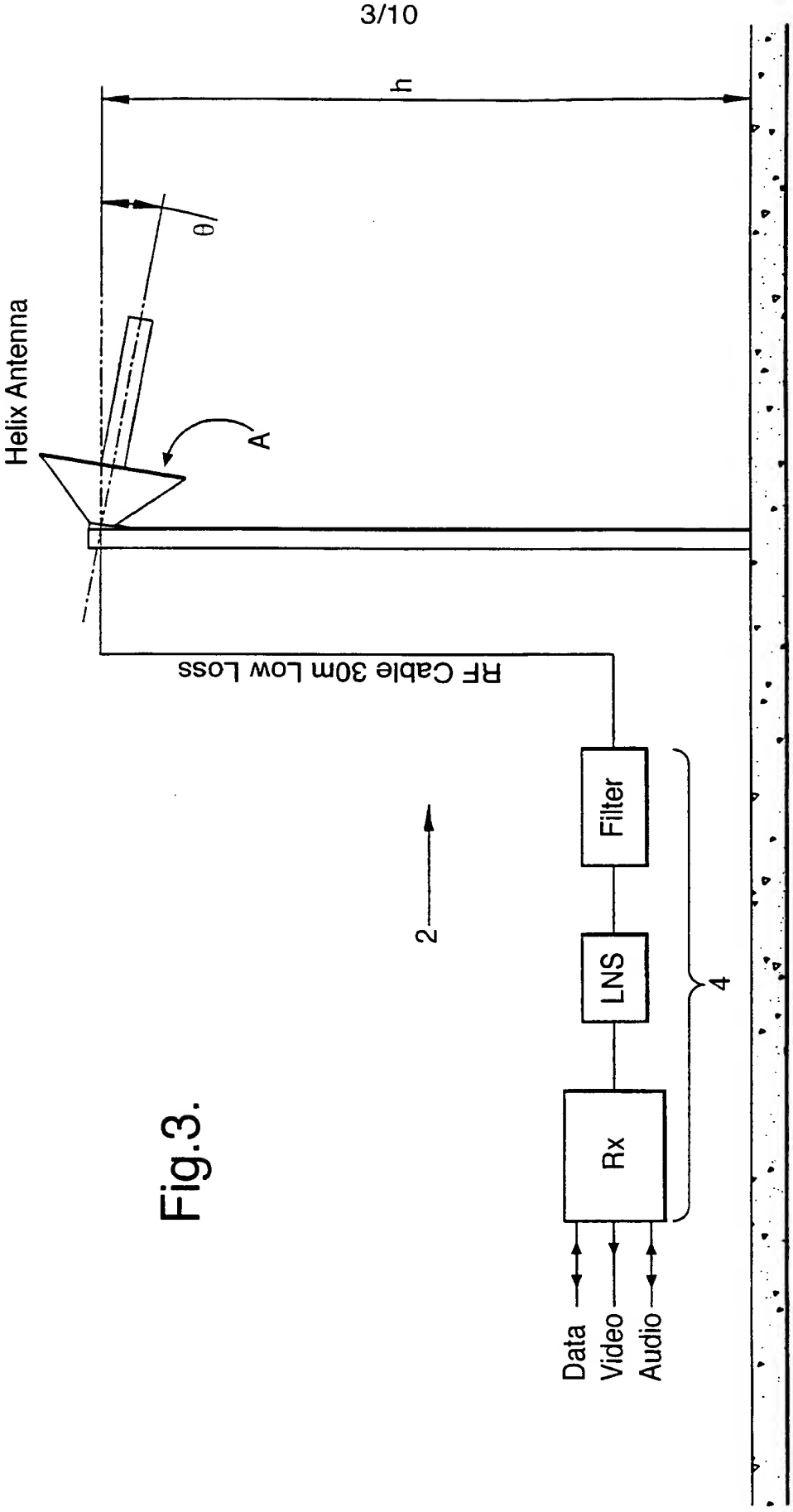
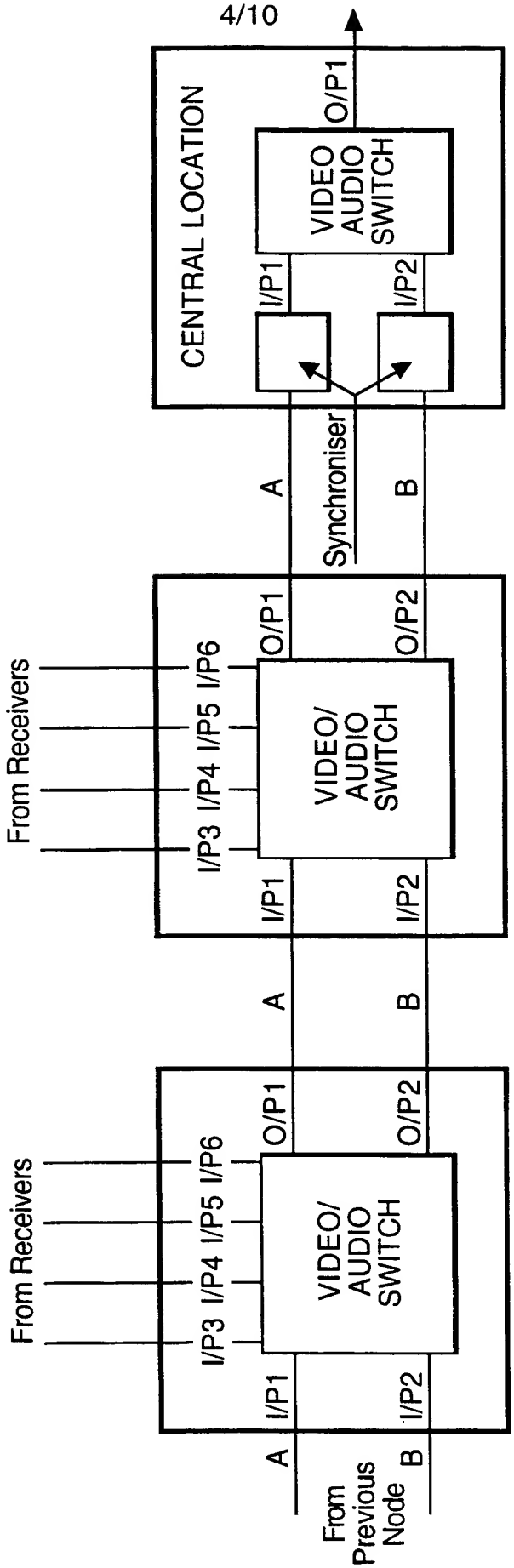

h
θ
Helix Antenna
A
RF Cable 30m Low Loss
Filter
LNS
Rx
4
2
Data
Video
Audio

Fig.3.

Fig.4.


CENTRAL LOCATION
VIDEO AUDIO SWITCH
O/P1
I/P1
I/P2
A
Synchroniser
B
VIDEO/ AUDIO SWITCH
From Receivers
I/P3 I/P4 I/P5 I/P6
O/P1
O/P2
I/P1
I/P2
A
B
VIDEO/ AUDIO SWITCH
From Receivers
I/P3 I/P4 I/P5 I/P6
O/P1
O/P2
I/P1
I/P2
A
B
From Previous Node

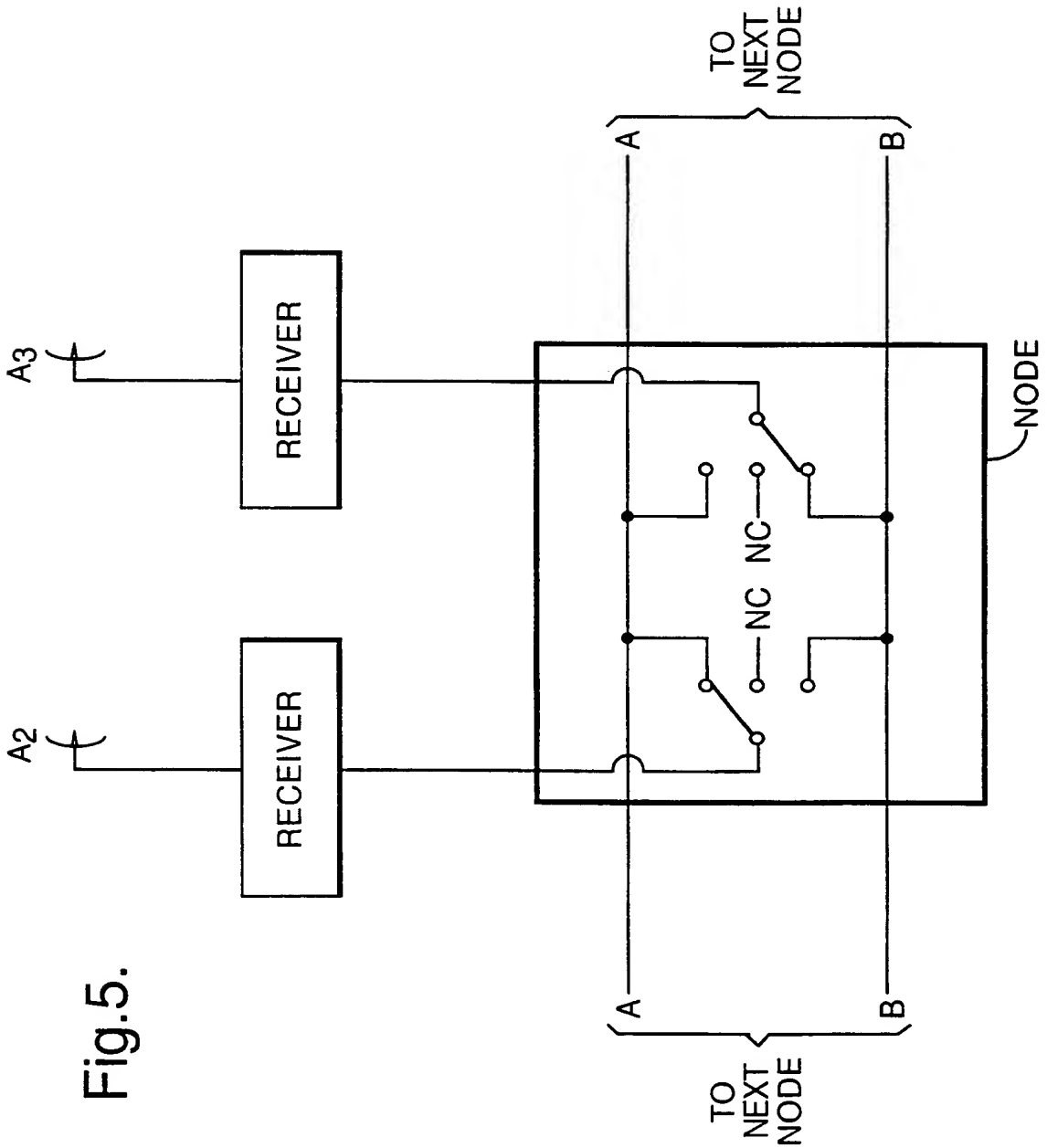

TO NEXT NODE
A
B
A3
RECEIVER
NODE
NC
NC
A2
RECEIVER
A
B
TO NEXT NODE

Fig.5.

Fig.6A.

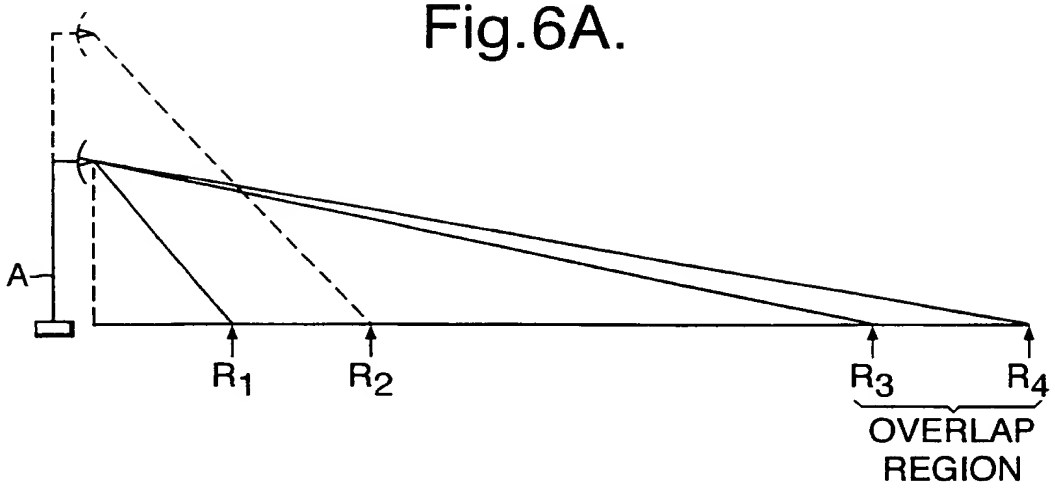


Fig.6B.

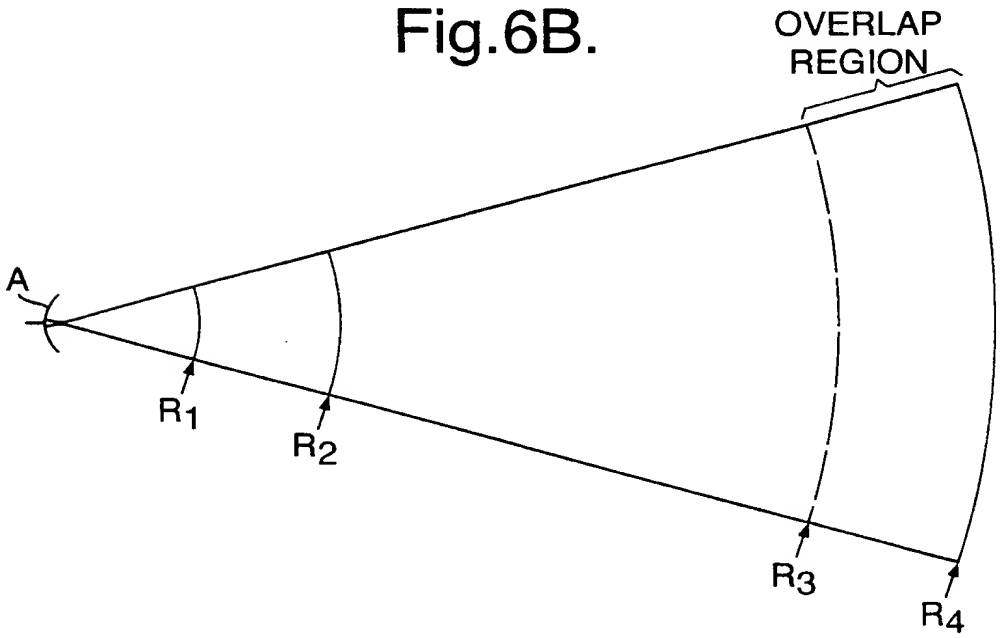
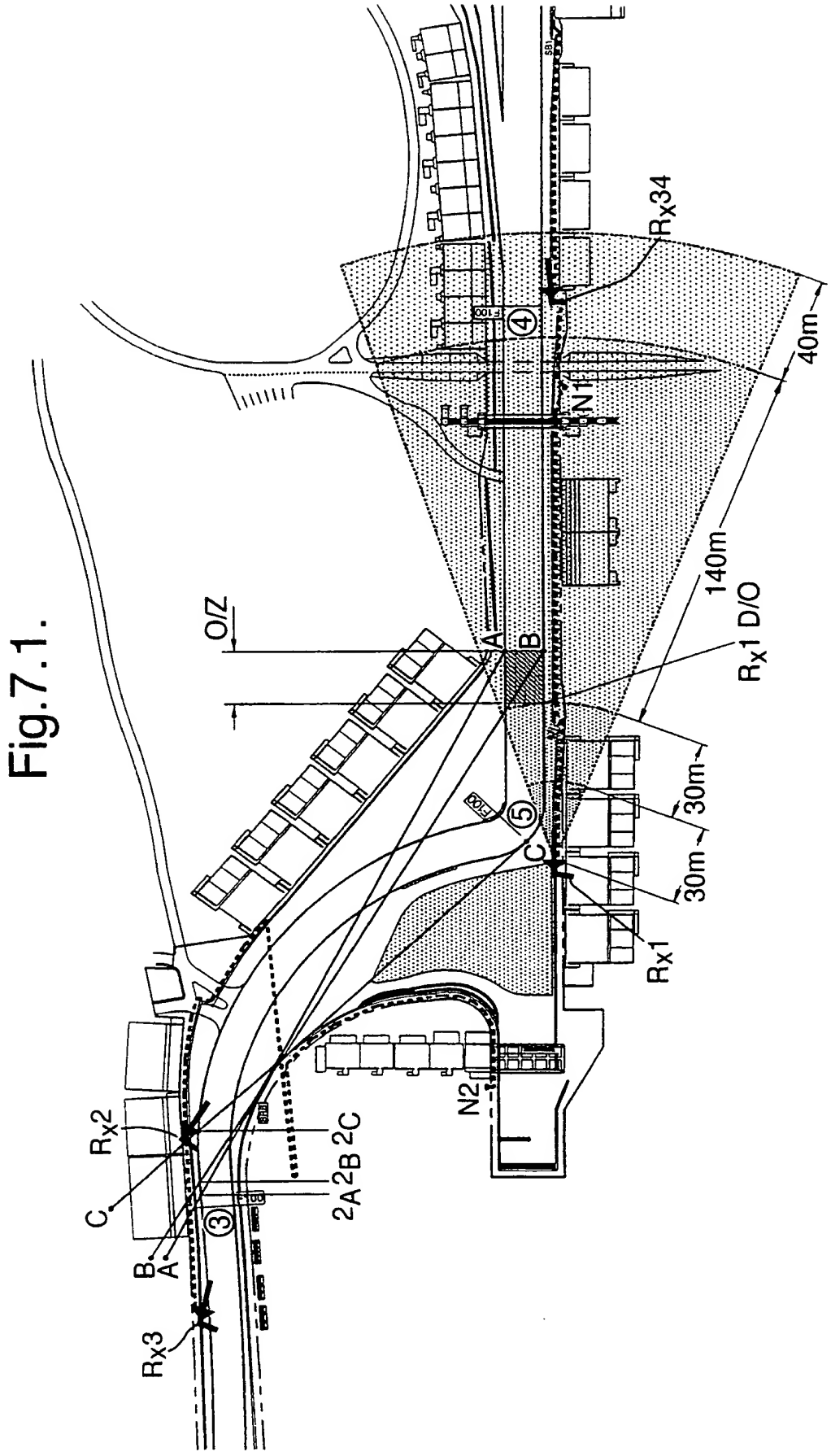


Fig.7.1.



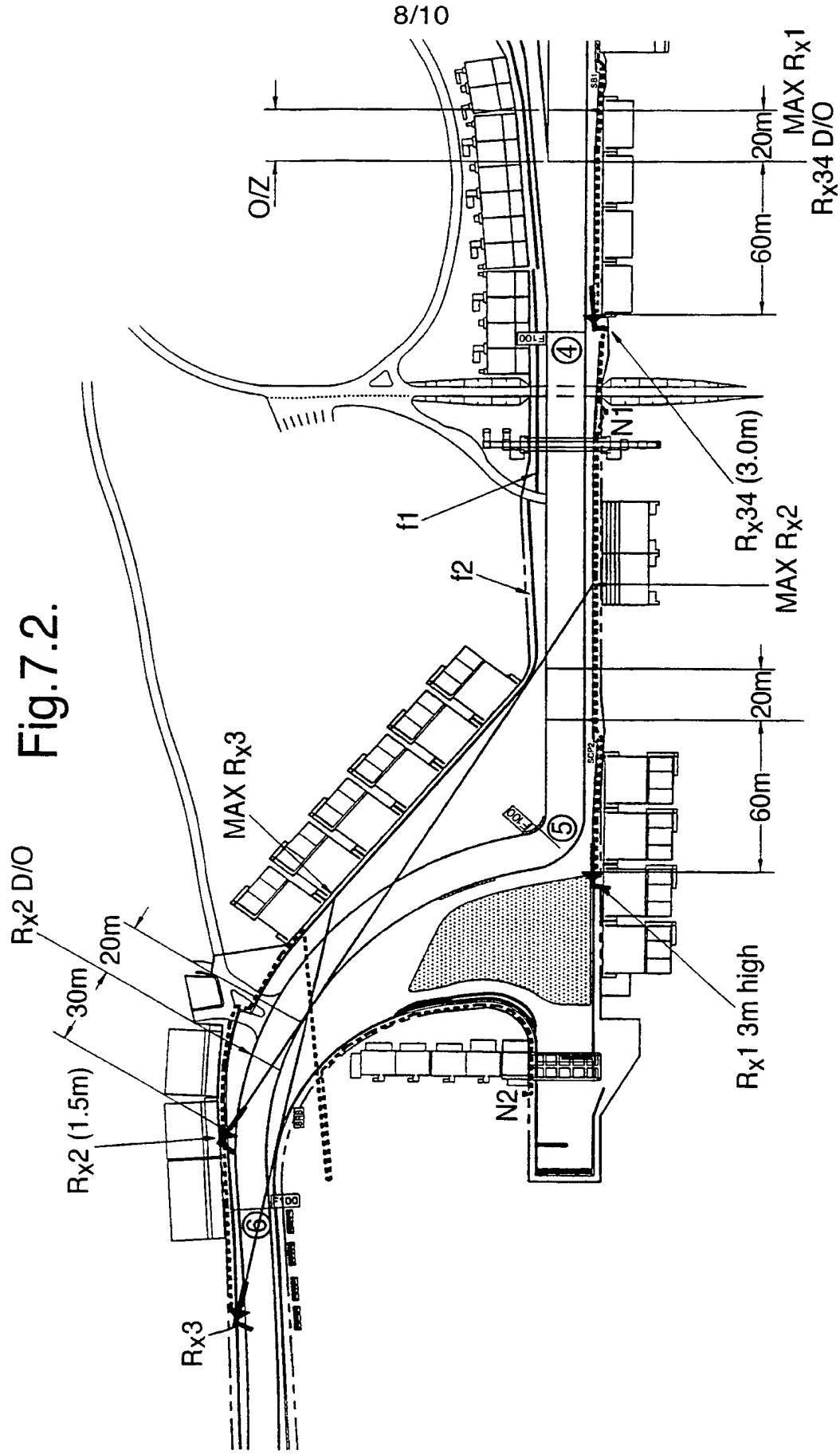

O/Z
20m
60m
MAX Rx1
Rx34 D/O
N1
f1
f2
Rx34 (3.0m)
MAX Rx2
20m
60m
MAX Rx3
Rx2 D/O
20m
30m
Rx2 (1.5m)
Rx3
N2
Rx1 3m high

Fig.7.2.

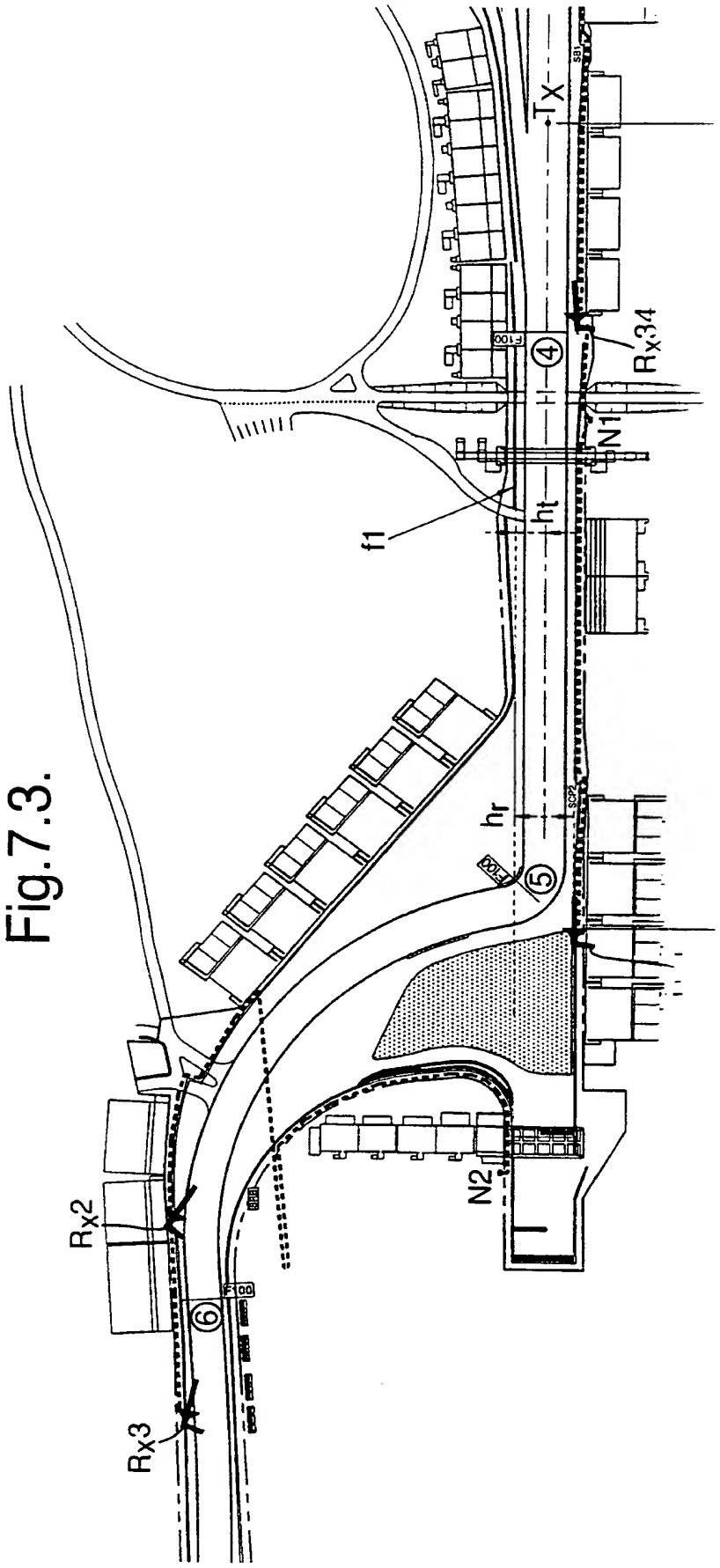


Fig.7.3.

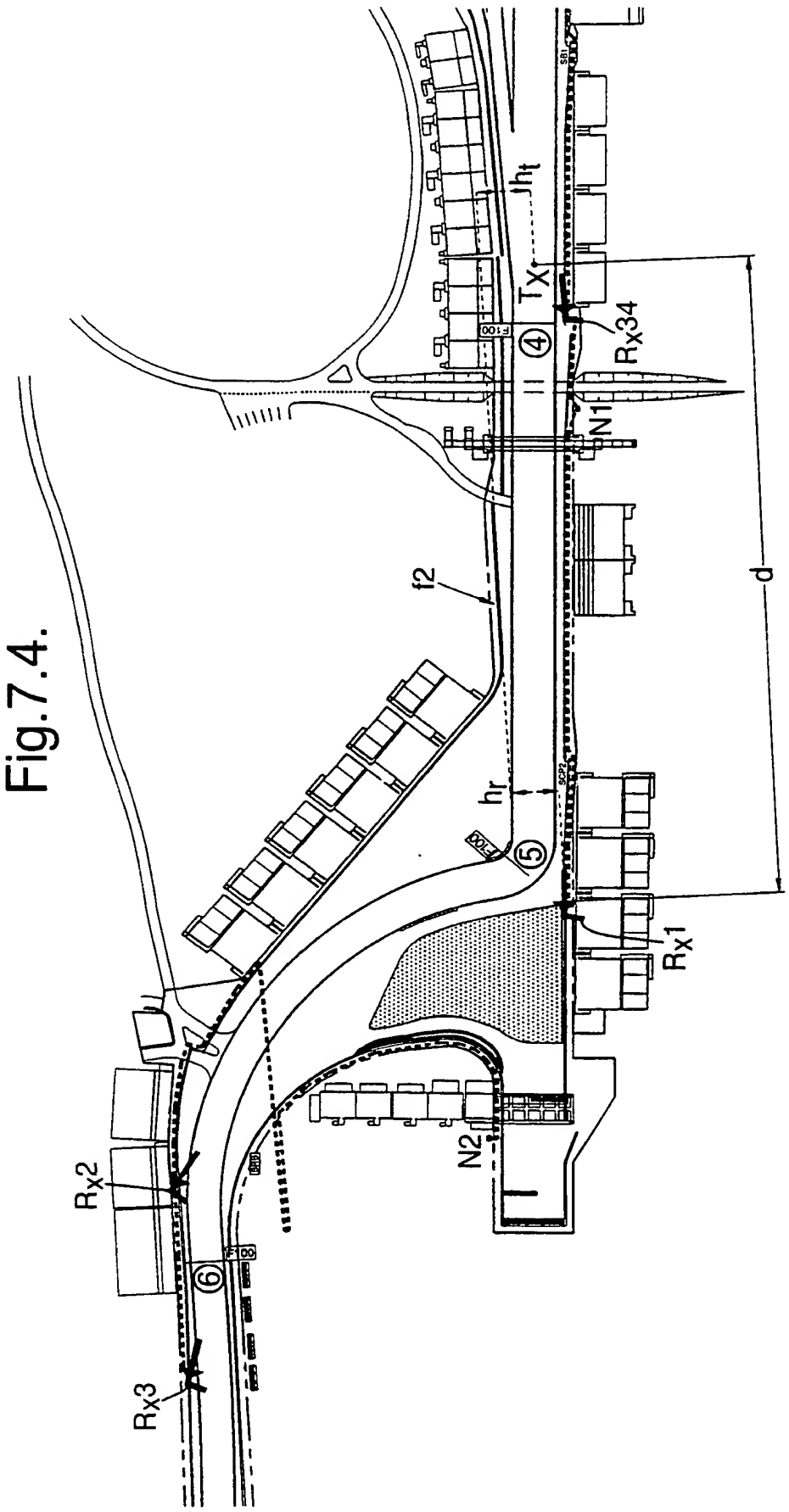


Fig.7.4.

INTERNATIONAL SEARCH REPORT

[redacted] Application No
[redacted] GB 99/00590

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04N7/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04N H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 307 375 A (BRITISH BROADCASTING CORP) 21 May 1997	13,14
A	see page 3, line 1 - page 4, line 7 see page 4, line 19 - page 5, line 19 see page 10, line 29 - page 11, line 2	1,12
A	DEVLIN B F: "Radio-cameras: the key to improved flexibility in live outside broadcasts" IEE COLLOQUIUM ON 'CIRCULARLY POLARISED ELEMENTS AND ARRAYS' (DIGEST NO.125), LONDON, UK, 13 JUNE 1991, pages 4/1-4, XP002104436 1991, London, UK, IEE, UK	1,12,13

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 June 1999	10/06/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Beaudoin, O

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

...on on patent family members

Int...al Application No
P... GB 99/00590

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2307375 A	21-05-1997	NONE	

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

LEEMING, John, Gerard
J.A. KEMP & CO.
14 South Square
Gray's Inn
London WC1R 5LX
ROYAUME-UNI

Date of mailing (day/month/year)
24 August 2000 (24.08.00)

Applicant's or agent's file reference
N.75180A JGL

IMPORTANT NOTIFICATION

International application No.
PCT/GB99/00590

International filing date (day/month/year)
26 February 1999 (26.02.99)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address
FORMULA ONE ADMINISTRATION LIMITED
14/16 Great Portland Street
London W1N 6BL
United Kingdom

State of Nationality: GB
State of Residence: GB
Telephone No.:
Facsimile No.:
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [ ] the name [X] the address [ ] the nationality [ ] the residence

Name and Address
FORMULA ONE ADMINISTRATION LIMITED
27/33 Mortimer Street
London W1N 8BZ
United Kingdom

State of Nationality:
State of Residence:
Telephone No.:
Facsimile No.:
Teleprinter No.:

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[ ] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

Authorized officer
Peggy Steunenberg
Telephone No.: (41-22) 338.83.38

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From the INTERNATIONAL BUREAU

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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 03 November 1999 (03.11.99)	
International application No. PCT/GB99/00590	**Applicant's or agent's file reference** N.75180A JGL
International filing date (day/month/year) 26 February 1999 (26.02.99)	**Priority date** (day/month/year) 05 March 1998 (05.03.98)
Applicant BAKER, Edward, Hendry et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

04 October 1999 (04.10.99)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

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Authorized officer

Marc Salzman

Telephone No.: (41-22) 338.83.38

The Patent Office

INVESTOR IN PEOPLE

Application No: GB 9817297.6
Claims searched: 1 to 18

Examiner: Jared Stokes
Date of search: 18 January 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H4F (FAAE, FAAX)
H4L (LDA, LDSHS, LDSHX, LDLX)

Int Cl (Ed.6): H04N (7/18)

Other: On-Line - WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	GB 2 308 955 A	(Motorola) See abstract, page 6 lines 9-12	1-4,7-10, 11,13,14, 16
Y	GB 2 296 632 A	(Siemens) See whole document	11
Y	GB 2 291 554 A	(Akhtar) See page 1 paragraph 4, claim 3	1-4,7-10, 11,13,14, 16
Y	GB 2 287 152 A	(Toad) See page 4 line 35-page 5 line 1	1-4,7-10, 11,13,14, 16
Y	GB 2 281 008 A	(Nortel) See abstract, page 10 lines 12-33	1-3,7-10, 13,14,16
Y	GB 2 273 424 A	(Motorola) See abstract	1-3,7-10, 13,14,16
Y	EP 0 600 818 A1	(Seral et al.) See fig.1, WPI Abstract Accession No.94-178104/22	1-4,7-10, 11,13,14, 16

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

The Patent Office

INVESTOR IN PEOPLE

Application No: GB 9817297.6 **Examiner:** Jared Stokes
Claims searched: 1 to 18 **Date of search:** 18 January 1999

Category	Identity of document and relevant passage	Relevant to claims
Y	EP 0 240 051 A1 (SDN) See whole document	1-4,7-10, 11,13,14, 16

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.